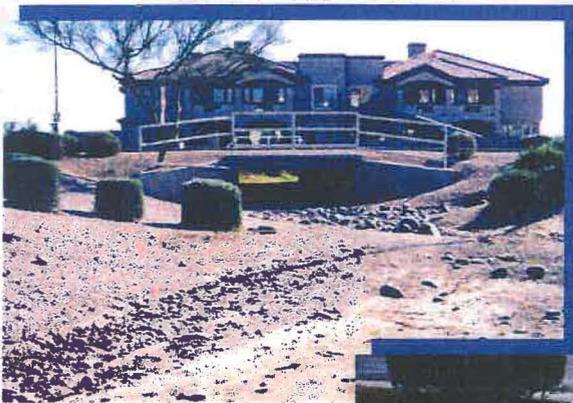




Submitted To:

**Flood Control
District of
Maricopa County**

**CANDIDATE ASSESSMENT REPORT
Upper Camelback Walk Wash
Flood Control Project
FCD Contract 98-24
Assignment No. 3**



Prepared By:



Revised
March 12, 2001

UPPER CAMELBACK WALK WASH C.A.R. EXECUTIVE SUMMARY

PURPOSE

Willdan has prepared this Candidate Assessment Report (C.A.R.) for the purpose of evaluating a capital improvement project originally submitted in 1994/95 by the City of Scottsdale to the Flood Control District of Maricopa County (MCFCD). The project area was originally bounded by Sweetwater on the north, 96th Street on the east, Shea Boulevard on the south and 90th Street on the west. The boundaries of this Report have been extended to the CAP Canal on the north and to 100th Street to the northeast.

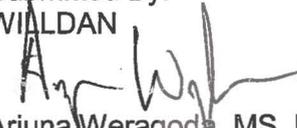
SUMMARY OF FINDINGS

In 1989 the City of Scottsdale commissioned the firm of Boyle Engineering Corporation to prepare a study that would develop the hydrologic and hydraulic parameters for future development and detailed design. This study, known as the Pima/Doubletree Area Master Drainage Plan (PDMP), was to develop a master drainage plan to provide an understanding of the existing problems and deficiencies, conceptual plans to upgrade the system and would include planning level cost estimates to carry out the improvement. Although portions of the plan have been constructed as envisioned, it is also evident that development has been allowed which significantly diverges from the plan in the construction of other structures and developments.

CONCLUSION

- Various local drainage channels and structures require immediate maintenance, including debris and sediment removal, to restore channel capacities and prevent local flooding.
- Visual observations of some structures within the main drainage channels appear not to have adequate capacity to convey the design flows established in the PDMP report.
- New developments in the north and the south end of the project have adhered to the retention requirements assumed in the PDMP study. The area bounded by Larkspur Drive, Cactus Road, 92nd Street and 100th Street have not met this requirement.
- Adequate bikepaths have been constructed in the north portion and a portion from Shea Boulevard to 92nd Street. Concrete and Asphalt footpaths have been constructed with a lack of continuity at various locations, especially in the new developments within the project. It is feasible to construct a bike path with some continuity within the project limits with a detail analysis of easements and drainage conveyance of the subject area.
- Field investigation reviewed that a portion of the channel from Larkspur Drive to Cactus Road has not been improved as suggested by the PDMP report.
- Utilizing the existing topographic information, combined with field investigation of structure sizes and slope, the hydrologic/hydraulic values for this drainage basin contained within the PDMP study can be updated to a DCR level.

Submitted By:
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I. REQUESTED PROJECT

Willdan has prepared this Candidate Assessment Report (CAR) for the purpose of evaluating a Capital Improvement Project originally submitted in 1994/95 by the City of Scottsdale to the Flood Control District of Maricopa County (MCFCD). The goal of the project, as submitted, is to eliminate flooding up to the 100-year event by providing a consistent level of protection and improvements throughout the drainage corridor. This CAR will be used to summarize the existing information relating to land use, previous hydrology/hydraulic reports, existing topographic mapping, as-built plans for existing structures, FEMA Flood Hazard Boundary Maps, and other pertinent information.

II. PROJECT AREA DESCRIPTION

The project area, as defined by the City's request, is bounded by Sweetwater on the north, 96th Street on the east, Shea Boulevard on the south and 90th Street on the west. However, based on joint meetings with MCFCD and COS staff, the north boundary of the study has been extended to the Central Arizona Project (CAP) Canal as shown on Figure I in Appendix A. The project is more particularly located within Township 3 North, Range 5 East and portions of Sections 5, 6, 7, 8, 17, 18, 19, 20, 29 and 30.

III. REVIEW OF AVAILABLE STUDIES AND MAPPING

The most prominent drainage feature in the watershed is the Camelback Walk Channel. The channel collects a majority of the runoff from the watershed northeast of Shea Boulevard and 90th Street.

This area, especially the north half, has experienced significant development within recent years with the conversion from a combination of low-density residential/commercial and open desert to high-density residential/commercial. The combination of this growth and the lack of planning/design in the older developed areas have placed serious strains on the existing storm water conveyance systems.

The City of Scottsdale (COS) revised its Design Standards and Policy Manual in December 1999. The policies contained in Section 2.1 of the Policy Manual were written to supplement Chapter 37 of the Scottsdale Revised Code (Code 1972, § 5-611; Ordinance No. 1993, 2/29/1988), otherwise known as the Floodplain and Drainage Ordinance. The policy manual required all subdivisions to develop a comprehensive drainage plan that addresses the drainage for the entire project site.

Unfortunately, not all subdivisions adhere to this policy. The drainage reports found at the COS Records Division and reviewed for several constructed projects over the years had many discrepancies in Q100, Q10, and drainage structure capacities.

A summary of the studies obtained and reviewed by Willdan, and the relevant portions associated with the area and its application to this project are listed below. Additionally, Figure 2 maps the areas of the studies reviewed along with those studies referenced in the reports but which Willdan was unable to locate copies:

A. Hydrology and Hydraulic Studies

1. 94th Street, Cactus Road to Sweetwater Avenue, Final Drainage Report, Alpha Engineering Group, Inc., March 13, 1992.

a) PURPOSE OF STUDY

The purpose of this study was to present the analysis of the site hydrology, assumptions utilized in the hydrologic evaluation and the hydraulic design, the associated calculations supporting drainage system design, and the results and recommendations for stormwater management for the proposed improvements to 94th Street. The proposed improvements entailed a storm water system collecting flows just upstream (north) of Sweetwater Avenue and outletting south of Cactus Road to the existing wash.

b) RESULTS DERIVED FROM 94TH STREET, CACTUS TO SWEETWATER STUDY

The final recommendation proposed installation of approximately 3482-LF RGRCP pipe, size ranging from 18-inch to 48-inches in diameter. The storm sewer will outfall to the wash located just west of 93rd Street. Furthermore, the catch basins located at the northeast corner of the Sweetwater intersection has been sized to accommodate the runoff on the eastern half of 94th Street from Thunderbird Road southward.

c) CAR APPLICATION

The report references the Pima/Doubletree Area Master Drainage Plan, which analyzed the subject area in 1989. It is unclear if the proposed storm system is picking up any flows from concentration points C30 and C90 established in the Master Drainage Plan as shown on Figure 4. Furthermore, the subject report states that the existing culvert south of Cactus Road associated with the west wash at Cholla Drive has less capacity than the culverts crossing Cactus Road but does not provide specific values.

2. 92nd Street and Cactus Road, Revised Preliminary Drainage Report, Landmark Consultants, Inc., December 1994

a) PURPOSE OF STUDY

The purpose of this report was to provide a preliminary investigation of the on-site and off-site flows, which impact the proposed project site. The proposed project site is a single-family residential subdivision located at

the northwest corner of Cactus Road and the projected alignment of 92nd Street.

b) RESULTS DERIVED FROM 92ND STREET & CACTUS ROAD STUDY

The report stated that development of the subject site would not conflict with any City of Scottsdale Master Planned Facilities and will comply with all FEMA, MCFCD and City of Scottsdale regulations. The tributary areas impacting the site will pass the site in an existing channel at the northeast corner of the site. The 100-year, 2-hour storm flows will be retained on-site.

c) CAR APPLICATION

The subject report had visually verified the drainage assumptions made by Boyle Engineering Corporation in the "Pima/Doubletree Area Master Drainage Plan" and had used the results as a basis for the hydrologic analysis.

The runoff volumes calculated by the subject report are slightly higher than the values reported in the "Pima/Doubletree Area Master Drainage Plan" at concentration points C10, C20 and C70 (refer to Figure 4 for concentration point locations) due to the fact that additional areas have been developed since the completion of the Master Plan.

3. 92nd Street Paving Projects S0718/S0719, Final Report, AMWEST Engineering Company, Inc., July 17, 1991.

a) PURPOSE/NARRATIVE OF STUDY

The report divided the study into two areas. Site 1, improvements to 92nd Street north of Gary Road along the west half of the street and Site 2, improvements to 92nd Street north of Sweetwater.

The culverts that impact drainage to site 1 are the 5-barrel 58"x36" CMP (Cul 1) crossing 92nd Street approximately 800-feet north of Cholla, and the 2-barrel 3'x10' concrete box (Cul 2) crossing Cholla approximately 300-feet east of 92nd Street as shown in Pictures 1.12 and 1.13 included in Appendix B Pages 4 and 5. The established Q₁₀₀ flows at Cul1 and Cul2 are 554-cfs and 652-cfs respectively. No return period was provided for the storm event analyzed. The report analyzed capacity at each culvert and its drainage impacts downstream. The major drainage feature that impacts Site 2 is the wash running north and south, west of 92nd Street as shown on Pic 1.30 in Appendix B Page 11. Three separate HEC-2 analyses were performed along the wash for existing conditions, new channel with culvert, and new channel with no culvert.

b) RESULTS/RECOMMENDATIONS DERIVED FROM 92ND STREET PAVING PROJECTS STUDY

The report states that the conditions at culvert #1 crossing 92nd Street north of Cholla can be improved to increase capacity to the 100-year Q of 554-cfs by constructing berms around the inlet drainage ditch. Furthermore, the report also recommends installing a 2-foot ± high wall about 12-feet upstream to force flow into the inlet in line with the pipe to eliminate the sediment deposition problem in the most northern pipe. The proposed 2-foot ± high wall is an existing structure per a site investigation conducted on the 26th of February 2001. The existing culvert under Cholla east of 92nd Street will not overflow and add storm water to the southeast corner of 92nd Street/Cholla intersection.

The conclusions for Site 2, states that Scottsdale Hills Subdivision should have filled the dip in 92nd Street and made the whole area higher than the 100-year water surface (WS) in the wash. It was not clear from a site investigation if the dip in 92nd Street was constructed. This project provided wash grading to save the existing trees, did not divert drainage to Sweetwater, and raised 92nd Street as much as possible, lowered the WS in the wash at street drainage outlet as much as possible, and reduced the 500-cfs flow pond depth in the street to 8-inches from 2.5-feet

c) CAR APPLICATION

The report utilizes the Pima/Doubletree Area Master Drainage Plan as a basis for hydrologic parameters. The report also verifies the Q₁₀₀ capacities at Culvert #1 and #2 and provides remediation to flooding along the wash at Site 2.

4. Pima/Doubletree Area Master Drainage Plan (PDMP), Boyle Engineering Corporation, November 1989.

a) PURPOSE OF STUDY

The purpose of this report was to develop a master drainage plan to provide an understanding of the existing problems and deficiencies, conceptual plans to upgrade the system and would include planning level cost estimates to carry out the improvements. Existing problems and those anticipated as a result of future development have resulted in this Master Drainage Plan. The study area, containing about 12 square miles, is bounded on the west by Pima Road, on the south by Doubletree Ranch Road and on the north and east by the CAP canal.

b) RESULTS DERIVED FROM PIMA/DOUBLETREE AREA MASTER DRAINAGE PLAN

The report concludes and notes that many of the channels and structures do not have sufficient capacity to convey design flows and therefore require upgrading. The report also discusses alternative measures to upgrade these deficient sections and provides preliminary cost estimates to assist in establishing the preferred alternative. The alternatives in this report were divided into Alternative A and Alternative B listed at the end of this Section.

The report identifies typical flooding in the study area, which are generally caused by inadequate capacity of existing drains, and the scattered and disjointed nature of drainage easements.

Typical flooding problems included:

- Cactus Road and 96th Street. Upstream of the intersection is over ¾ mile of dedicated drainage easement that ends about one block northeast of the street intersection. Flood flows are channeled almost to the intersection and then turned loose.
- 96th Street between Cactus and Cholla and along 103rd Street between Cactus to Cholla. Both these problems are caused by inadequate drain capacity.
- There is some street flooding in the new subdivisions in the northeastern part of the study area. Flooding is caused by desert runoff being intercepted by new subdivision streets. (Many of these problems will be alleviated when the whole area becomes urbanized.)
- Flooding at Shea Boulevard and 116th Street is caused by incomplete drainage systems. In that particular location there is a drainage channel upstream and a channel at 114th Street but none in between. Between 116th Street and 114th Street the storm flows go down Shea Boulevard.

None of these flooding problems were observed during our field reconnaissance of the study area.

The two alternative improvements proposed by the report, which impact the Upper Camelback Wash Project are listed herein:

Basin C Alternatives

- ❖ **Alternative A&B** Construct a culvert at 91st Street and Cholla (C120). Eliminate split flow that occurs just south of Sweetwater and 99th Street (D20) and convey flow to 95th and Cactus.
- ❖ **Alternative A** Upgrade the channels from 92nd and Thunderbird to 92nd and Cactus (C20-C70) and from 95th and Sutton to 92nd and Desert Cove (C45-C145). Upgrade culvert at 92nd and Cholla (C130).
- ❖ **Alternative B** Construct a storage basin at 95th and Sutton (C35) and channel upstream flows to basin (C20-C35 and D10-C35). Upgrade channel from 95th and Cholla to 92nd and Desert Cove (C140-C145).

Basin D Alternatives

- ❖ **Alternative A & B** Because the drainage improvements for Basin C route runoff from subbasins D10, D20 and D30 into Basin C, the only drainage improvement needed for Basin D is to upgrade the culvert capacity at 96th Street and Cholla (D40).

c) CAR APPLICATION

This report is a vital document for our project due to the fact that it analyzed hydrologic implications for the area bounded by the Upper Camelback Wash Project. Worth noting is one of the assumptions and recommendations of the report to “adopt existing percent impervious area for future conditions. Any future development will not increase flows because of storage requirements.” This clearly states that any future development in this study area will have to retain all excess flows generated from post development. Figure 2 shows the drainage-way, concentration points, Q₁₀₀ flows impacting our study area and addressed in the subject report.

It is unclear where the 587-cfs at concentration point A-20 located at the intersection of Thunderbird Road and Pima Road is being conveyed in the subject report. Although concentration point A-20 is beyond the study limits of this report, its effect downstream of Shea Boulevard must be

considered in any future improvements contemplated downstream of Shea Boulevard.

A field investigation conducted by Willdan revealed most of the improvements proposed by the PDMP study were in-place, except for a culvert crossing Cholla at 91st Street. Instead of a culvert crossing Cholla, a valley gutter is in-place at the present time. No storage basin was to be found at 95th Street and Sutton during the filed investigation.

5. Montage, Final Drainage Report, Development Engineering, Inc., September 14, 1993.

a) PURPOSE OF STUDY

The purpose of this report was to evaluate the hydrologic impacts due to off-site and on-site flows. The subject project is a 91-lot, single family subdivision on approximately 20 gross acres located 660-feet north of Raintree Drive on the east side of 92nd Street.

b) RESULTS DERIVED FROM MONTAGE FINAL DRAINAGE REPORT

The off-site analysis was based on two reports prepared by Clouse Engineering, which are labeled as "Desert Shadows" and "Desert Sage Unit II." The subject report proposed a 30-inch storm drain between lots 15 and 16 to convey the off-site drainage from the north that overflows the retention basin of Desert Shadows and allowed it to flow back into its historical drainage path south of the development. The subject study has provided for on-site retention, but it is not clear which design storm was used in the hydraulic calculations.

c) CAR APPLICATION

The subject report and its referenced reports have violated a major assumption about retaining flows on-site established in the Pima/Doubletree Area Master Drainage Plan by not constructing any on-site retention basins. Furthermore, the subject report states that "Don Kirby of the City of Scottsdale indicated that a portion of the site could be allowed to drain into 92nd Street, provided that enough retention for the entire site is provided and that the requirements for dry lanes in the 100-year event is met for 92nd Street", which is also contrary to the Master Drainage Plan assumptions and recommendations.

6. Sonoran Vista, Drainage Report, Clouse Engineering, Inc., January 25, 1996.

a) PURPOSE OF STUDY

The purpose of this report was to establish off-site and on-site drainage characteristics and flows for the development of Sonoran Vista Subdivision. The subject property is 13.7-acres in size located at the northwest corner of Redfield Road and 94th Street.

b) RESULTS OF SONORAN VISTA DRAINAGE REPORT

The study proposed to retain the additional pre vs. post on-site flows in depressed landscape open areas between buildings and drives. The study also proposed to construct three (3) 36-inch concrete pipe culverts crossing the driveway entrance to convey the 100-year off-site flow of 160-cfs. Furthermore, all runoff on-site, above the elevation of 1455-feet will drain by a 6-inch gravity bleed line to the box culvert under Redfield Road, near the intersection of Redfield Road and 94th Street.

c) CAR APPLICATION

The Sonoran Vista Report assumed that retention requirements would be satisfied with new development upstream of the subject site. Therefore, this report did not consider a post development scenario for its off-site hydrologic analysis. This report validates one of the important assumptions (retain pre vs. post development flows) made in the Pima/Doubletree Area Master Drainage Plan (PDMP) Study. The report also assumed 65% of impervious coverage for the drainage area labeled "F", in the subject report which is an existing apartment complex with very little on-site retention capabilities.

It is worth stating the 1st paragraph under Post-Development from the subject report in its entirety, in order to elaborate on the storm water conveyance in the subject area:

"After discussions with the City of Scottsdale's drainage planners, it was decided that the offsite runoff from the north would be intercepted and directed to the box culvert under Redfield Road, just west of 94th Street. These flows will be intercepted at their entrance points and routed along northern and western perimeter of the site within landscaped drainage channels."

7. Mirada At Scottsdale Horizon Residential Subdivision, Final Drainage Report, American Engineering Company, February 1994.

a) PURPOSE OF STUDY

The purpose of this report was to present the on-site and off-site results of the final hydrologic analysis for development of the site. The site is a rectangular shaped parcel of approximately 12.6 net acres, located at the southeast corner of 100th Street and Thompson Peak Parkway.

b) RESULTS OF MIRADA AT SCOTTSDALE HORIZON

The study proposed to construct a temporary retention basin in the future Thompson Peak Parkway right-of-way to capture the 100-year peak flow from the area north of future Thompson Peak Parkway improvements. The basin will not be needed once Parcel "E" referenced in this study is developed. The on-site pre vs. post development flows from a 100-year, 2-hour storm will be retained on-site. A 24-inch RGRCP pipe with a 10-inch orifice was proposed to restrict the outflow from the retention basin for a larger storm.

c) CAR APPLICATION

The report provided valuable information in establishing the cut-off point for the upstream boundary as the Central Arizona Project (CAP) canal.

8. Foothill Shadows, Preliminary Hydrology Report, D.N.A., Inc., September 1987

a) PURPOSE OF STUDY

The purpose of this report was to evaluate and present existing on-site and off-site conditions, proposed on-site storm water collection and retention systems. The subject site a residential development, which contains approximately 13.57-acres, located at the southeast corner of Redfield Road and 92nd Street.

b) RESULTS OF FOOTHILL SHADOWS HYDROLOGY REPORT

The study evaluated the off-site impacts by dividing the drainage area into three separate basins. The study proposed to convey all off-site flows through the development to its natural flow path with improved channels and storm drains. Furthermore, retention will be provided on-site for the difference between the pre-and-post development runoff generated during a 100-year, 1-hour storm event.

c) CAR APPLICATION

The report provides valuable information regarding drainage pattern, hydraulic routing and discharge capacities for the area north of Redfield Road. The report also states that the west wash entering the intersection of Redfield Road at 92nd Street has been altered from its historical flow path due to the fact that construction west of 92nd Street ignored its natural flow path. Another significance to the CAR Application is the conveyance of storm flows in Wash II from this report versus that of Sonoran Vista, which lies directly north of this site. The Sonoran Vista study diverted this flow to 94th Street, whereas the Foothill Shadows report diverts the flow to 92nd Street. The existing condition, based on field investigation conducted as part of this CAR, found the flows diverted to Wash-1 along the west side of 94th Street as shown on Figure 4.

9. Desert Rose, Preliminary Drainage Report, Clouse Engineering, Inc., December 4, 1989**a) PURPOSE OF STUDY**

The purpose of this technical drainage report was to address both on-site and off-site drainage analysis and improvements necessary to mitigate the impact of the proposed residential development on adjacent properties. The proposed development is bounded by 90th Street on the west, 92nd Street on the east, Raintree Road on the South, and the Village subdivision and undeveloped land to the north.

b) RESULTS OF DESERT ROSE PRELIMINARY DRAINAGE REPORT

The subject report proposes catch basins and storm drain systems to capture and convey the 10-year event. On-site retention will be provided for pre vs. post development storm flows generated on-site.

c) CAR APPLICATION

The information provided, especially the Preliminary Master Drainage Map, depicts the drainage area and concentration points north of Raintree Road which are not shown in the PDMP report.

10. Cabo Del Rey, Final Drainage Report, Pre-Engineering, Inc., April 1986**a) PURPOSE OF STUDY**

The purpose of this report was to investigate the hydrological conditions for Cabo Del Rey, a single-family residential development, totaling 10-acres. The project is located at the southeast corner of 96th Street and Cholla Street.

b) RESULTS OF CABO DEL REY DRAINAGE REPORT

The study analyzed two drainage basins labeled "A" and "B" as off-site. The drainage basin "A" is described as rather long (two miles) and narrow consisting of approximately 250-acres; basin "B" is triangular in shape containing approximately 23-acres. The study proposes to retain pre vs. post development 100-year, 1-hour storm flows on-site.

c) CAR APPLICATION

The off-site flow (Q_{100}) information provided in the report is useful in determining a Q_{100} flow of 110-cfs at 96th Street and Gary Road.

11. Shea Business Park, Drainage Report, WBC Consultants, Inc., October 1980**a) PURPOSE OF STUDY**

The purpose of this technical drainage report was to evaluate and present existing on-site and off-site conditions, proposed storm water collection and retention systems. The subject property is located at the northwest corner of Shea Boulevard and 92nd Street.

b) RESULTS OF SHEA BUSINESS PARK DRAINAGE REPORT

The study addressed both on-site and off-site drainage impacts and proposed improvements necessary to mitigate the impact of the proposed development on adjacent properties in accordance with City of Scottsdale (C.O.S) drainage regulations.

c) CAR APPLICATION

The report clearly defines and describes the drainage facilities crossing 92nd Street and Desert Cove Drive to be a 4-barrel 5-foot by 8-foot box culvert. A discrepancy exists in the Q_{100} flow rates at some crucial concentration points from the subject report to the Master Drainage Plan for Pima/Doubletree area as can be seen from Figures 2 and 4 in Appendix A. The major difference is at concentration point C-26 (Figure 4) from this report vs. concentration point C-145 (Figure 2) in the PDMP report. The flow at C-26 is 1000-cfs vs. 1900-cfs at C-145. This discrepancy in flows appears to be a result in the difference in the hydrologic modeling.

12. EL DORADO PRIVATE SCHOOL, Preliminary Hydrology And Hydraulics Report, Clouse Engineering, Inc., March 29, 1988.

a) PURPOSE OF STUDY

The purpose of this report was to provide a preliminary investigation of the on-site and off-site flows, which impact or affect the proposed project site. The site is located at the southwest corner of Larkspur Drive and 96th Street. Larkspur Drive is located approximately ¼ mile north of Cactus Road.

b) RESULTS OF EL DORADO SCHOOL HYDROLOGY & HYDRAULICS REPORT

The study recommended improvements to drainage channel sections along the west and east boundary of the subject site to convey off-site flows. The two west and east channels were labeled as channel "A" and "B" respectively.

Channel "A"

Top Width	=	30 - feet
Bottom Width	=	12 - feet
Total Depth	=	3 - feet
Side Slopes	=	3H: 1V
Q ₁₀₀	=	230-cfs

Source of Q₁₀₀ = 130-cfs will be conveyed through the 5 barrel, 24 inch concrete pipes crossing Larkspur Drive and the remaining 100-cfs will overtop the street flowing at six inches deep and back into the wash.

Channel "B"

Top Width	=	32- feet
Bottom Width	=	13 feet
Total Depth	=	4- feet
Side Slopes	=	Vary from 4H: 1V along the right of way, to a retaining wall and 1H: 1V sides with erosion protection
Q ₁₀₀	=	281-cfs

Source of Q₁₀₀ = 281-cfs from the existing dual barrel ten foot by three foot box culvert crossing the intersection of Larkspur Drive and 96th Street.

c) CAR APPLICATION

The report provides valuable information about the channel and structure improvements as shown on Pics 2.9, 2B.1, and 2B.2 in Appendix B Pages 24 and 25, and establishes Q₁₀₀ storm flows at both culvert crossings as summarized in Section XII.

13. VISTA PARC, Hydrology And Hydraulics Report, Clouse Engineering, Inc., July 5, 1988 And Revised August 11, 1988.

a) PURPOSE OF STUDY

The purpose of this study was to address on-site and off-site flows impacting the subject site. Vista Parc is a residential development 54.7-acres with 201 individual lots bounded by Pima Road on the west, 92nd Street on the east, Palos Verdes subdivision to the north, and Sweetwater Avenue on the south.

b) RESULTS OF VISTA PARC HYDROLOGY & HYDRAULICS REPORT

The study recommended improvements to drainage channels along the property boundaries to convey off-site and on-site flows. The project also proposed to construct on-site storm drainage system which included catch basins and culverts to convey storm flows. The subject study proposed to retain the 100-year, 2-hour storm flows on-site.

c) CAR APPLICATION

The hydrologic information provided in this report is useful in determining Q_{100} storm flows at crucial concentration points as shown on Figure 4 in Appendix A and addressed in Section VII. The magnitude of the Q_{100} flows along the subject perimeter does not match the Master Drainage Plan. The concentration points B-10 and B-15 (Figure 2) from the PDMP study corresponds to concentration points C-12 and C-13 (Figure 4) in the Vista Parc report. The Q_{100} flows at concentration points C-12 and C-13 are approximately 30% lower than B-10 and B-15.

14. Scottsdale Vista No. 2, Hydrology And Hydraulic Report, Clouse Engineering, Inc., September 1978.

a) PURPOSE OF STUDY

The purpose of this report was to evaluate the hydrologic implications from off-site and on-site flows and design/improve storm drainage structures to convey the flows. The original approved drainage study for the A.B.C. Ranch Estates dated November 26, 1973, was used to provide hydrology data for this report. The subdivision is located at the northeast corner of Cholla and 92nd Street.

b) RESULTS OF SCOTTSDALE VISTA NO.2 HYDROLOGY & HYDRAULICS REPORT

The study analyzed two off-site drainage basins labeled as west wash and east wash corresponding to Wash-1 and Wash-2 respectively on Figure 4 of this CAR in Appendix A. The east wash dikes on both sides of the channel are to be leveled to contain a 4-foot water surface elevation in the 100-year frequency runoff and still leave a majority of the existing large

trees in the wash. The study proposed to re-locate the west wash and construct a new channel with 4H:1V side slopes. All culverts for both washes were designed to carry only a 25-year frequency runoff under the roads, and the excess flow will weir over the street.

c) CAR APPLICATION

A major discrepancy exists in the Q_{100} flows at the north property line from the Master Drainage Plan. The subject report shows 435-cfs and 549-cfs versus 770-cfs and 1,108-cfs from the Master Drainage Plan at the west and east washes respectively. Furthermore, it does not appear that the subject site has provided any type of on-site retention. The improvements proposed by the subject study for both washes are in-place at the present time as can be seen from Pics 1.16 and 1.17.

15. Mission Del Arroyos, Preliminary Hydrology Report, D.N. A., Inc., June 1987

a) PURPOSE OF STUDY

The purpose of this report was to evaluate drainage impacts for a proposed development consisting of 236 apartment units. The subject site is bounded on the north by Cholla Street, on the west by 92nd Street, east by Wash-2, and south by the La Contessa subdivision. The overall contributing drainage area analyzed in the report was divided into a westerly drainage area known as drainage area I, and an easterly drainage area known as drainage area II.

Although the subject study referenced the Scottsdale Vista II (#14) Hydrology and Hydraulic Report the subject report performed its own off-site analysis using the SCS method.

b) RESULTS OF MISSION DEL ARROYOS HYDROLOGY REPORT

The study proposed to improve the west wash from the existing box culvert crossing Cholla Street, to the La Contessa property directly south of the subject site. Retention will be provided on-site for the difference between the pre and post development runoff generated during a 100-year, 1-hour storm event. The flows overtopping the retention basins will be channeled to the west wash.

c) CAR APPLICATION

The subject report differs from the Scottsdale Vista II Study on the Q_{100} flows in the two washes. The difference in the flows from these two reports are not that significant compared to the Master Drainage Plan as can be seen from Figures 2 and 4 in Appendix A. All improvements to the subject site were set back approximately 75-feet from the east wash. The east wash remained in its natural condition and no improvements were proposed as can be seen in Pic 2.2 in Appendix B Page 22.

16. Pima Freeway – Shea Boulevard To 90th Street, Final Drainage Report, Wood/Patel Associates, July 31, 1999

a) PURPOSE OF STUDY

The purpose of this report was to evaluate and define on-site and off-site hydrologic conditions, apply highway design elements, hydraulic design standards, and provide a main storm drain design for the proper drainage of the Pima Freeway, Shea Boulevard to 90th Street segment.

b) RESULTS OF PIMA FREEWAY DRAINAGE REPORT

Although the subject project was to construct the Pima Freeway south of Shea Boulevard, the report performed an off-site hydrologic analysis northward all the way to the CAP Canal.

The study established a Q_{100} flow of 1155-cfs for the Camelback Walk Channel just north of Shea. Although not specifically called out in the report, ADOT standards typically require a 6-hour storm event. The hydrology design in this report was based on procedures presented in the Highway Drainage Design Manual, Hydrology, Metric Edition, Arizona Department of Transportation, December 1994.

As part of the proposed drainage system design, the existing channel located along the east side of Pima Road was to be replaced with a concrete lined channel/RCBC.

c) CAR APPLICATION

Although the project construction is outside the limits of this CAR, the subject report provided very useful information such as Q_{100} flows and drainage boundary limits. The report states that the results from the PDMP study are significantly different to that of the subject report (flows in this report are higher than the PDMP report along Pima Road) due to the differences in the procedures used. Therefore, the PDMP data was utilized only for basin parameter information (topographic mapping, land-use, soil type, etc.). Furthermore, the project team felt that the hydrologic analyses should be refined for three reasons. First, substantial development had occurred in the contributing watershed since 1989. Second, ADOT modified their hydrologic procedures and methodologies when they published the Highway Drainage Design Manual-Hydrology. Third, extremely limited right-of-way required the project team to optimize the off-site drainage system.

B. Project Reports Unavailable for Reviews

The following list of constructed projects or subdivisions were observed during field inspections or referenced in other reports and documents, but the design reports were either unavailable or non-existent for a detailed review and incorporation into this CAR. It is believed that the information contained in them may be significant in its impact on the proposed project:

- City of Scottsdale Master Drainage Plan
Note: Based on a conversation with Afshin Houraiyan at MCFCD, City of Scottsdale Master Drainage Plan references the PDMP report for its hydrologic/hydraulic analyses for the subject area.
- Desert Shadows
- Desert Sage, Unit II
- Scottsdale Foothills (157-DR-85)
- Las Hadas (197-DR-85)
- Palos Verdes
- Scottsdale Hills
- Encantada
- Desert Shadows III
- Sweetwater Ranch Manor
- Camelot Ranch
- Vista Del Rincon
- Costa Verde
- Scottsdale Horizon Parcel 6 L & M
- Sweetwater Ranch Estates, Unit III
- Sweetwater Ranch Manor, Unit II
- Larkspur Manor
- Sweetwater Ranch Estates, Unit II
- Sagewood
- Country Trace Two
- Scottsdale Mountain View Estates, Unit II
- Manzanita Villas
- Berryessa
- Trailside at Manzanita Ranch
- Scottsdale Vista
- Mission Santa Fe
- La Contessa
- San Carlos
- Ladera Vista
- Sweetwater Ranch Village at Sweetwater Ranch
- Sweetwater Ranch Foothills at Sweetwater Ranch
- Highlands Luxury Apartments
- Scottsdale Vista North Townhomes
- Lutheran Church
- Walgreens
- San Marcos
- Existing School

- Sweetwater Estates
- 92nd Street and Raintree

Figure 3 in Appendix A provides a detailed location map for referencing both available and unavailable development reports within the project study limits.

IV. AS-BUILT CONSTRUCTION PLANS

Following is a list of As-Built Construction Plans obtained and reviewed from the City of Scottsdale Records Retention Center:

Name	Type	Engineer	Date	COS Tracking No.
Superpumper, 90 th St & Shea Blvd. (Sheets 2)	Grading & Drainage	Johannessen & Girand Consulting Engineers.	Feb, 1988	14753
92 nd Street Paving. (Sheets 6)	Paving	RHP Consulting Engineers, Inc.	8/3/1988	18043
92 nd Street Widening, Gary Rd to Cholla St and Sweetwater Ave to Voltaire Drive. (Sheets 23; Landscape Plan from sheet 18-22)	Paving, Water & Sewer	AMWEST	8/8/91	22524
Cactus Substation, Grading, Surfacing, & Fence Plan. (Sheets 3)	Grading	Arizona Public Service Company	Unknown	2467
Desert Cove Professional Plaza. (Sheets 3)	Grading & Drainage	Brooks, Hersey & Associates	April, 1997	29690
Mountain Shadow Healthcare Center. (Sheets 2)	Grading & Drainage	Collar, Williams & White Engineering, Inc.	2/3/84	8187
Scottsdale Personal Care Center. (Sheets 4)	Paving, Sewer, & Water Plans	Unknown	11/7/84	11152
Scottsdale Mission Improvement Plans. (Sheets 20)	Improvement Plans	DNA, Inc.	6/8/94	27769
Shea Business Park. (Sheets 15)	Grading & Landscaping Plans	WBC Consultants, Inc.	July, 1980	5125
D.C. Professional Center. (Sheets 3)	Grading & Drainage Plan	Brooks, Hersey & Associates	12/10/97	34842
Mission Del Arroyos. (Sheets 13)	Improvement Plans	DNA, Inc.	8/5/87	17288

Cabo-Del Rio. (Sheets 17)	Improvement Plans	Louis C. Warner & Company's Surveyors	June, 1992	22340
North Scottsdale Nursing Center. (Sheets 8)	Water, Sewer, & Paving Plans	American Engineering Company	Unknown	12463
La Contessa. (Sheets 6)	Improvement Plans	Anderson-Nelson	8/27/87	14627
Paradise Memorial Gardens. (Sheets 5)	Paving Plans	Coe & Van Loo	9/22/89	19867
Scottsdale Vista. (Sheets 11)	Paving Plans	Clouse Engineering	5/4/77	10265
Sagewood. (Sheets 26)	Water, Sewer, & Paving Plans	Unknown	10/29/85	15196
Trailside Estates @ Manzanita Ranch. (Sheets 13)	Water, Sewer, & Paving Plans	Collar, Williams & White Engineering, Inc.	3/27/84	12301
East Fork Channel, Cactus Rd. to Ocotillo (Larkspur) Dr. Project No. F2702. (Sheets 18)	Storm Drain Plans	Brufat Engineering Company	12/9/93	23297
Scottsdale Vista No. 2. (Sheets 10)	Grading & Drainage Plans	Unknown	12/26/79	2777
Scottsdale Retreat. (Sheets 8)	Improvement Plans	DNA, Inc.	6/8/95	34614
Eldorado Private School. (Sheets 4)	Grading, Drainage, & Paving Plans	Vaughn & Standage Engineering, Inc.	7/18/88	17675
94 th Street, Cactus Rd. to Sweetwater Ave. (Sheets 48)	Public Improvements	Unknown	Aug, 1992	22547
Drainage Improvements; Hayden/Gelding – 92 nd Street Channel. (Sheets 16)	Drainage Improvement Plans	AMWEST	2/24/93	24278

V. HISTORIC FLOOD DATA/DAMAGE ANALYSIS

No historical flood data or damage caused by floods within the study area were to be found in the City's records division or through City personnel, except for the problems stated in the PDMP report. Discussions with Bill Erickson at the division of Transportation on the 13th of February 2001 revealed no known flooding problems in the study area, except for the drainage structures had not been able to convey the large storm event flows.

The problems stated in the PDMP report for the study area are as follows:

- Cactus Road and 96th Street. Upstream of the intersection is over ¾ mile of dedicated drainage easement that ends about one block northeast of the street intersection. Flood flows are channeled almost to the intersection and then turned loose.
- 96th Street between Cactus and Cholla and along 103rd Street between Cactus to Cholla. Both these problems are caused by inadequate drain capacity.
- There is some street flooding in the new subdivisions in the northeastern part of the study area. Flooding is caused by desert runoff being intercepted by new subdivision streets. (Many of these problems will be alleviated when the whole area becomes urbanized.)

VI. EXISTING/PROPOSED DRAINAGE STRUCTURES

Table 2 in Appendix A shows a list of all the major structures within the study area. The table describes the structures, its existing condition, ownership, party responsible for the maintenance of structure and design capacity of structure if known. Figure 5A, Structure Identification Number (Id). Plan shows the approximate location of these structures. Where hydraulic variables were available, Willdan performed hydraulic computations to determine the capacities of these structures and are noted as such on Tables 2 and 3 in Appendix A.

VII. PLANNED RECREATIONAL FACILITIES/LANDSCAPE CONCEPTS

The existing public recreational facilities within the subject area are the Aztec Neighborhood Park located at Frank Lloyd Wright Boulevard and 100th Street, and the Thunderbird Neighborhood Park located at Thunderbird and 92nd Street. The study area also abuts the Camelback Walk recreation corridor south of Shea Blvd with an improved concrete bike/walking path running parallel to the channel northward from Shea to 92nd Street as can be seen from Pics 1.1 through 1.3. Numerous open space/retention areas are located within subdivisions and are available for local resident use within that particular subdivision as shown on Figure 4 in Appendix A. There are no other recreational facilities planned at the present time within the study area.

Chapter 7, City of Scottsdale Landscaping of the Design Standard and Policies Manual addresses the planning, design, maintenance and construction of median landscape, streetscapes, and non-paved trails within the City of Scottsdale. This chapter also presents standards and policies to serve as a guide during the design phase of Park and Recreation facilities.

Median Landscaping: This section of the manual describes the City's Median Design Standards. It is intended to acquaint designers and developers with these

standards; as well as to assist them in processing plans through the plan review process in an efficient and timely manner.

Maintenance of landscape medians will be the responsibility of the developer, property owner, or a homeowners association for a given period of time (usually 3 years). This period of responsibility will begin and end following inspections and acceptance of installation by a representative of the City's Planning Inspection unit. Furthermore, the particulars for maintenance responsibility of medians are to be stated on the final landscape plans submittal, the final plat, and/or in a separate agreement with the City.

Streetscapes: Streetscapes are defined as the appearance of the corridor that exists along a street alignment between the buildings on each side of the street. This section is intended to aid designers in developing hardscape, landscape, irrigation and general aesthetic improvements for those spaces within the City's streetscape corridors.

Maintenance of the City's streetscapes will be the responsibility of the abutting development's property owner, developer or homeowner's association. This applies to all landscaping and irrigation within the defined streetscape. Maintenance responsibility of hardscape and other amenities is particular to each site and should be defined through the development review process.

Non-Paved Trails: The City of Scottsdale's goal is to develop and maintain a city-wide interconnecting network of trails to provide valuable recreation and transportation opportunities for City residents and visitors. The information in this manual will provide direction for the planning, design, maintenance, and construction of trails within the City of Scottsdale. These trails have been classified for the specifications in Section 7-303 as follows:

1. Urban Trails
2. Rural Trails
3. Backcountry Primary Trails
4. Backcountry Secondary Trails
5. Interpretive Trails
6. Barrier-Free Trails

The most common trail systems within the study area are the urban and rural trails.

Trails are frequently located within common tracts and easements dedicated for other purposes such as drainage, flood control, public utility, natural area open space, and scenic and vista corridors. In situations where these common tracts and easements are wider than that needed for a trail easement, it may be advantageous to dedicate the same area of these coinciding common tracts and



easements for the purpose of public trail use. Proper drainage of surface water is the most important factor in design, construction, usage and maintenance of trails. Surface erosion resulting from improper drainage will have a detrimental impact on the trail surface, causing damage to the natural environment and increasing maintenance requirements. Attempts to alter the existing drainage patterns will have a negative effect on the natural environment, and will most likely result in severe damage to the trail.

Urban Trails: The trail surface must have a cross slope of 3 to 5%. This is critical in preventing water from pooling on and channeling down the trail. If the trail

traverses the side slope of a hill, the cross slope of the trail surface must be downward from the uphill to the downhill edge of the trail (outslope). This will allow surface water to drain off the edge of the trail rather than running down the length of the trail. Urban trails must be contained in a minimum 15-foot wide trail easement. In situations where a trail easement overlaps with common tracts or easements



dedicated for other purposes, it may be beneficial to dedicate the entire width for public trail purposes. For trails along streets, the minimum distance from back of curb to the edge of the trail is 25-feet along expressways and parkways, 15-feet along arterials, 10-feet along collectors, and the maximum distance feasible in all other locations.

Rural Trails: The trail surface must have a cross slope of 6 to 10%. This is critical in preventing water from pooling on and channeling down the trail. Rural trails must be contained in a minimum 25-foot wide trail easement. In situations where a trail easement overlaps with common tracts or easements dedicated for other purposes, it may be beneficial to dedicate the entire width for public trail purposes. Rural trails must be located the maximum distance feasible from the edge of the street.

VIII. SOCIOECONOMIC ENVIRONMENT

Scottsdale, a city in central Arizona, located within the County of Maricopa in the Phoenix metropolitan region was built over 200-miles of irrigation canals to support their initial agrarian lifestyle. The City is a popular winter resort and an arts and crafts center with some electronic equipment manufacturing facilities. In the City are the Taliesin West architectural school, established by American architect Frank Lloyd Wright, the Cosanti Foundation, containing the workshop of Italian-American architect and craftsman Paolo Soleri, and a community college. Scottsdale is noted for its efforts to preserve desert environments within the city. The innovative Indian Bend Wash Greenbelt, a flood control project, uses a system of parks, lakes, and golf courses as an alternative to a conventional concrete channel.

The City of Scottsdale is the fourth largest City in the Phoenix metropolitan area. During the 1980's, the City grew tremendously in both area and population through the annexation of nearly 100 additional square miles and the addition of approximately 40,000 people. Strong population growth has continued through the 1990's, averaging 6.3% annual growth during the first half of the decade. In 1997, the Census Bureau designated Scottsdale as the seventh fastest growing City in the United States. The census from July, 2000 indicates the population in Scottsdale at 215,080, and the median age at 39.7-years.

Scottsdale is a relatively affluent community, with both an average and above-average standard of living and an above-average cost of living. Notably, the least costly aspect of living in Scottsdale is the purchase of miscellaneous goods and services to which residents direct the percentage (33%) of their spending. The most costly aspect of living in Scottsdale is the price of housing, which exceeds the national average by approximately 16%. According to a census in July, 1999 there are 89,660 occupied units in Scottsdale, in which 67% are owned and 33% rented. The average cost of a house according to a census in 1998 is at \$ 228,000. There are approximately 1,166 people per square mile and 2.26 persons per household according to a census taken in July, 2000.

A 1999 study by Gruen Gruen & Associates ranked business services (advertising, computer programming, legal, engineering and accounting) as the number one employment industry in Scottsdale, providing 17.9% of jobs. The remainder of Scottsdale's employment base comprises a diverse mix including retail trade, hospitality, health industry, construction and high tech businesses. Scottsdale household incomes consistently exceed national and state median household incomes. The 1995 Special U.S. Census indicated the median annual household income of Scottsdale residents was \$48,319, compared to the Phoenix metropolitan area average of \$35,623. According to a July, 2000 estimate the median household income is at \$61,700. The unemployment rate for Scottsdale has consistently been about 30% lower than the rate for the entire Phoenix metropolitan area, and more than 40% lower than the rate for the State of Arizona. As of September 1998, Scottsdale's unemployment rate was about 1.99%.

The education level of Scottsdale residents is quite high, with more than 70% (age 25 and older) having attended some college, and 34.5% having earned a bachelor's degree or higher. More than 90% of Scottsdale residents (age 25 and older) graduated from high school.

Scottsdale's assessed valuation is second only to Phoenix in the State of Arizona. The total assessed valuation of property in Scottsdale rose from \$1.2 billion to \$2.1 billion between Fiscal 1988/89 and Fiscal 1998/99. This represents a 63% increase in just a 10-year period. In Fiscal 1998/99, Scottsdale's assessed value was \$10,754 per capita. Scottsdale's property values are growing at a faster rate than its population. This is, perhaps, reflective of the fact that Scottsdale is currently experiencing more commercial growth than residential growth. Scottsdale has a current City property tax rate of \$10.69 per \$100 of assessed valuation. On average, that's about 33% lower than in neighboring communities.

IX. PLANNING, LAND USE AND ZONING

Scottsdale Master Plan, City of Scottsdale, 1999.

The project lies within the incorporated boundaries of the City of Scottsdale, which has jurisdiction over issues relating to land use and zoning for development. Originally adopted by the City in 1985, the Master Plan with its associated land use map provides a broad framework to promote orderly growth. It ensures compatibility and a logical transition between residential, commercial and industrial developments that meet the vision and goals of the citizens and leaders of the community.

General land uses identified within this project area include Business Park/Industrial, Community Commercial, Medium and High Density Residential, and most significantly, Park/Open Space along the channel and basin alignments. Principal and major traffic arterials identified are Shea Boulevard, Cactus Road, Thunderbird Road, Frank Lloyd Wright and 94th Street.

Scottsdale Zoning Maps, City of Scottsdale, 1999.

Specific zoning districts, which are the detailed application of the general land use categories, include Commercial (C0, C2, C3, & C4), Industrial Park (I-1) and Industrial Garden (I-G), Passenger Auto Parking (P-2 & P-3), Multifamily and Single Family Residential (R1-35, R1-7 PRD, R1-18, PRD, R-5 & S-R), Resort Residential (R4-R), Schools (R1-43) and Open Space (OS). Integrated developments include Planned Community Development (PCD), Planned Residential Development (PRD) involving mixed-use industrial, commercial and residential elements.

The current *Federal Emergency Management Agency (FEMA) flood insurance rate maps* 0450120025B, Panel 25 of 45, revised December 4, 1984, indicate the area is primarily zone B. Zone B is defined as the area between the limits of the 100-year and 500-year floods, or certain areas subject to 100-year flooding with average depths less than one (1) foot, or where the contributing drainage area is less than one square mile, or areas protected by levees from the base flood.

Flood Plain and Drainage Ordinance, Chapter 37 REVISED CODE, City of Scottsdale, Arizona

Enacted in 1988, the ordinance establishes requirements and regulations, which govern the use and development of land within the City. The specific intent is to minimize the occurrences and severity of losses and hazards that would result from flooding caused by the surface runoff of rainfall.

Of particular interest and application is Section 37-42 Paragraph 2 *Drainage Characteristics*, which states that "as a minimum, drainage and flood control easements will be dedicated to the City to the extent of the estimated one-hundred-year flood for all water courses having a capacity of twenty-five (25) cubic feet per second or greater, and the development shall be responsible for the maintenance of the watercourse". Additionally Paragraph 3, *Street Crossings At Natural Or Man-Made Channels* requires local/minor collector streets to fully pass a 10-year storm and be overtopped by no more

than 6" during a 25-year event and major collector/major & minor arterial streets to fully pass a 50-year storm and be overtopped by no more than 6" during a 100-year event.

Paragraph 4, *Streets As Water Carriers* specifies that streets are not to be used as major water carriers in lieu of natural washes or man-made channels. The maximum depth for water flowing in any street is to be eight (8) inches during the peak runoff from a 100-year storm. Paragraph 12, *Storm Water Storage Facilities* requires developments to provide storage in the form of retention or detention basins for rainfall events up to and including the 100-year 2-hour event.

Design Standards and Policies, Section 2.1 Policies, Revised December 1999, City of Scottsdale, Arizona. The information included in Section 2.1 is intended to serve as a guide, to assist in the implementation of the requirements of the Floodplain and Drainage Ordinance.

Of particular interest and application is Section 2-102, General Drainage Policies:

a) Drainage Easements

Continuous drainage easements are essential to the protection and proper operation and maintenance of wash corridors and floodplains.

1) Acquisition

Drainage easements should be identified and dedicated to the city as early as possible in the development process. Per ordinance, within the Environmentally Sensitive Lands (ESL) area of the city, all washes with a 50 c.f.s. or greater capacity must remain in their natural state and their 100-year floodplain dedicated as a drainage easement. In all other areas of the city, a drainage easement must be dedicated to the extent of the 100-year flood for all washes with a 25 c.f.s. or greater capacity. It is also city policy to require a drainage easement for washes with a 100-year discharge of 50 c.f.s. or greater.

2) Maintenance

City policy is that maintenance of drainage facilities is generally the responsibility of the individual property owner or the Homeowners Association upon whose property the facility is located. This is the case even though the facility is located within a drainage easement dedicated to the city. The recorded plat and grading and drainage plan shall specify maintenance responsibility.

3) Release

The release or modification of a drainage easement is possible but only if one of the following special circumstances can be documented:

- Upstream flows have been physically cut off or diminished.
- More detailed topographic mapping and aerial photography has shown the original dedication to be incorrectly located; or

- The original hydrology was found to be out of date or in error.
- b) Subdivisions
- 1) Proposed subdivisions must develop a comprehensive drainage plan that addresses the drainage for the entire project site. Individual lot grading plans shall not alter the approved comprehensive Grading and Drainage (G&D) subdivision plan.
 - 2) Maintenance of common subdivision or neighborhood drainage facilities shall not be made the responsibility of an individual property owner. Drainage facility(s) shall be placed in a common Tract or a dedicated drainage easement. Common drainage facilities should overlap more than one lot and be located outside the building envelope. Maintenance responsibilities shall be clearly identified on the grading and drainage plan and on the recorded plat.
- c) Storm Drains and Natural Washes
- 1) Within the ESL area, intercepting a natural wash with a capacity of 50 c.f.s. or greater, and directing it into an underground storm sewer system, is prohibited (see City Code, Section 37-42 (14) a.).
 - 2) Intercepting a natural wash and piping it underground is strongly discouraged in any area of the city for any size wash. Most natural washes and constructed channels in Scottsdale transport a significant amount of sediment, trash, and debris. If there is no alternative to the routing of an open channel into a piped system, water should be first routed into a sediment or debris basin. Periodic maintenance of the basin will be necessary in order to maintain its effectiveness. Maintenance is generally the responsibility of the homeowner or the HOA, and shall be clearly specified on the final plat and/or noted in the easement dedication.
- d) Culverts
- 1) The culvert invert shall be as close as possible to the natural stream bed. Any culvert having an invert elevation more than six inches below the natural stream profile shall be assumed to have only the waterway opening above the streambed profile for hydraulic capacity calculations.
- e) Open Channels
- 1) Within ESL areas of the city, natural watercourses of 50 c.f.s. capacity or greater are intended to be maintained in their natural state. In all areas of the city, diversions of natural washes or changes in a channel's profile should be avoided whenever possible.

- 2) No person in the city shall either obstruct or reduce the capacity of a watercourse (Section 37-44). Construction of any kind in a dedicated drainage easement requires a City Encroachment Permit.
- 3) Channel lining material shall be inlaid or placed below the design invert (bottom) of the channel. Do not place lining material on top of the designed finished grade of the channel. This may severely reduce and/or eliminate the ability of a channel to convey flow, causing ponding and backwater problems on streets and adjacent properties.
- 4) The channel surface material (roughness coefficient), cross sectional area, or alignment shall not be changed without a plan revision and re-approval by city Staff.
- 5) When only lining the channel sides or banks, lining material must extend down below the channel invert to the estimated scour depth.
- 6) Extending lot lines or building envelopes across natural wash or its floodplain or a drainage easement should be avoided whenever possible. The wash area and floodplain or drainage channel should be dedicated in a separate common area tract and dedicated as a drainage easement.
- 7) Channels shall not be designed or located within walled back yards that go from yard to yard under or through walls. Wall openings commonly catch debris, clog, and block or divert flow and homeowners often block off or plug these openings. These channels are practically impossible to inspect or access for maintenance.
- 8) Walls, fences and other permanent structures should not be located within a designated drainage easement, a watercourse or its floodplain.

X. UTILITIES

a) Storm Drainage

Several storm drainage features are within the project boundaries and will have an impact upon the final project. These include pipe, culverts, open channel conveyance structures and detention/retention basins related to community, commercial and residential developments. Specific features identified, which are shown in Appendix B, Pictures, and the related location referenced in Figure 5. Furthermore, storm drainage structure locations and its descriptions can also be found in Figure 5A and Tables 2 and 3 in Appendix A.

b) Water

Major 30-inch and a 24-inch water line follow the alignment of 100th Street and Shea Boulevard respectively. Another 24-inch line follows the Raintree Drive

alignment west of 92nd Street. A 16-inch line follows the Cactus Road alignment west of 96th Street. 12-inch to 10-inch water lines follow the alignments of Cactus Road, Thunderbird Road, Frank Lloyd Wright Boulevard, 96th Street and 94th Street. These lines act as transmission lines for other local distribution lines of 8 inches and 6 inches located within each subdivision as shown in Figure 8.

c) Waste Water

The major wastewater feature that must be of concern is a 24" sanitary sewer trunk line within 96th Street and Cactus Road. At various intervals 10" and 12" collector lines and 8" local lines tie into the main trunk line as shown in Figure 8.

d) Electric Transmission

Primary electric facilities consist of both underground and overhead lines. Secondary power is generally placed underground throughout all areas.

e) Communications

Telephone cable and CATV cable run through a combination of underground and overhead lines, depending on the location and age of the development. Major trunk cables cross all major street intersections.

f) Gas

Natural gas distribution is provided by Southwest Gas Corporation through a system of 4" transmission lines serving adjacent developments. Distribution lines of 1-1/4" and 2" size were shown on the company maps. The larger size transmission lines should not affect any proposed construction but the smaller distribution lines, along with individual services, would be expected to require some protection or relocation.

XI. ENVIRONMENTAL

1. Hazardous Wastes and Cultural Concerns:

A field review of the project limits was performed on January 18 and 27, 2001 to identify any visual environmental concerns on the project. Arjuna Weragoda performed this survey. Visual review indicated that the site is an intensely developed urban setting and no hazardous waste sites or archeological findings were immediately evident. The northern boundary is adjacent to the Central Arizona Project Canal. North of the CAP lies the McDowell Mountain area, which is classified as an Environmentally Sensitive Land by the Environmentally Sensitive Lands Ordinance (ESLO).

2. U.S. Army Corp of Engineers 404 Permit:

Due to portions of the proposed project being a tributary of the Indian Bend Wash, the USCOE 404 permit and ADEQ 401 Water Quality Certification will be required for work within areas which are designated as Waters of the United States. Waters of the United States are defined from 33CFR part 328 as "all waters such as ...rivers, streams (including intermittent streams).." and "Wetlands adjacent to waters". Jurisdictional boundaries of these Waters are defined as ordinary high water mark plus wetland boundary.

The first step in defining the extent of the requirements for these permits is to obtain a jurisdictional boundary determination from the USCOE. The District may either define the limits themselves or present their findings to the USCOE for concurrence or have the USCOE define them. The jurisdictional boundary coupled with the limits of work to be performed will determine the extent of the necessary 404/401 certifications from no permit to a nationwide permit to an individual permit. Possible Nationwide permits which can be obtained will include:

- 7. Outfall structures
- 13. Bank stabilization
- 18. Minor Discharges
- 24. State Administered Section 404 Programs
- 26. Headwaters and Isolated Waters Discharges
- 31. Maintenance of Existing Flood Control Structures

3. US Fish and Wildlife Service(USFWS):

Should a 404/401 permit be required the USFWS will be required to have a determination on threatened or endangered species, which may be affected by the project. USFWS was contacted and the following list of threatened and endangered species were identified within Maricopa County:

<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>
American peregrine falcon	<i>Falco Perigrinus anatum</i>	Endangered
Arizona agave	<i>Agave arizonica</i>	Endangered
Arizona cliffrose	<i>Purshia subintegra</i>	Endangered
Arizona Hedgehog cactus	<i>Echinocereus triglochidiatus arizonicus</i>	Endangered
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Threatened
Bonytail chub	<i>Gila elegans</i>	Endangered
Cactus ferruginous pygmy owl	<i>Glaucidium brasilianum cactorum (AZ)</i>	Endangered
Desert pupfish	<i>Cyprinodon macularius</i>	Endangered
Gila topminnow	<i>Poeciliopsis occidentalis</i>	Endangered
Lesser long-nosed bat	<i>Leptonycteris curasoae yerbabuenae</i>	Endangered
Mexican spotted owl	<i>Strix occidentalis lucida</i>	Threatened
Razorback sucker	<i>Xyrauchen texanus</i>	Endangered
Sonoran pronghorn	<i>Antilocapra americana sonoriensis</i>	Endangered
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	Endangered
Yuma clapper rail	<i>Rallus longirostris yumanensis</i>	Endangered

A certified biologist will be required to review the list and the project limits for determination of effect of species on this list. Also the regional USFWS works

closely with the Arizona State Game and Fish and will require coordination with the state list of threatened and endangered species.

XII. SUMMARY OF FINDINGS

Based upon a review of studies and reports noted above and field inspections of the project area, the following summarizes our findings:

- Although the City's Records Retention Center contained many plans and reports available for review, many listed in their index were unavailable. This lack of coordinated documentation, cataloging and records retention relating to storm water as-built plans and design reports limits coordination and research.
- Inconsistencies in the hydraulic capacity of constructed improvements for adjacent projects and street crossings have resulted in a corresponding variation in the expected level of flood protection. This is also substantiated by historic observation by City Staff.
- Inconsistencies in the use of the storm event for retention requirements could have an adverse impact on downstream properties and drainage structures. Furthermore, some drainage/retention facilities are designed for a 100-year-2-hour pre vs. post development standard in accordance with current City Code, but do not take in to account the 100-year, 6-hour storm event, which violate the assumptions made in the PDMP study.
- Intercepting Wash-2C (Figure 4) and piping it underground along Larkspur Drive and 96th Street without a debris basin is in violation with Section 2-102 of the Design Standards and Policies Manual.
- The Mirada at Scottsdale Horizon Residential Subdivision does not identify any 100-year, 6-hour storm event flows at concentration point C-4 shown in Figure 4 to determine any overflow from the retention basin to the existing storm water conveyance system crossing Frank Lloyd Wright (FLW). Furthermore, the study does not address the box culvert crossing FLW as shown in Pic 2A.12 in Appendix B Page 37.
- The Montage report and its referenced reports have violated a major assumption about retaining flows on-site established in the Pima/Doubletree Area Master Drainage Plan.
- Based on available records, it is unclear if the drainage structures constructed with the development of Sonoran Vista, especially the culvert crossings within Wash-1 and 1B accounted for conveying the 100-year, 6-hour storm event flows.
- The wash labeled Wash-1D in Figure 4 downstream of the Foothill Shadows development is not confined to a typical channel section as can be seen from Pic 1D.3 in Appendix B, Page 21. 185-cfs referenced in the drainage report

from Foothill Shadows impacts this unconfined channel probably causing severe downstream impacts to properties and structures in the major event.

- The Vista Parc report established Q_{100} and Q_{10} flows along the boundary of the subject site at concentration points C-11, C-12 and C-13 with respective Q_{100} flows of 163-cfs, 177-cfs, and 43.6-cfs as noted on Figure 4 in Appendix A. The constructed channels along the perimeter were designed for the 100-year storm event, yet no calculations were performed on culverts for the same event. Furthermore, the rational method and guidelines from ADOT publication "Hydrology Design for Highway Drainage in Arizona", dated April 1975 were used in the hydrologic analysis. These methods and guidelines could be outdated at the present time.
- Report No.1 prepared by Alpha Engineering Group designed a storm drainage conveyance system within the 94th Street alignment to capture storm flows for the 100-year event within the right-of-way starting just north of Sweetwater Avenue and ultimately discharging flows into Wash-1 as shown in Figure 4. The report demonstrated Wash-1 to have a capacity of 770-cfs at 2.75-foot depth just south of Cactus Road.
- Scottsdale Vista No.2 identified a Q_{100} of 435-cfs at concentration point C-14 as labeled in Figure 4, which is significantly lower than the calculated Q_{100} of 770-cfs at this concentration point in the PDMP report. Furthermore, the drainage plan identifies the structure crossing Cactus as a 5-barrel 31" x 50" x 56" CMP, when Pic 1.20 in Appendix B, Page 7 show a 3-barrel CMP at this same location. In addition the main channel labeled as Wash-1 in Figure 4 and labeled "west wash" in the Scottsdale Vista No.2 report no longer crosses Cactus Road at this location. The Q_{100} flows identified for the "east wash" at concentration point C-15 in Figure 4 is approximately 51% lower than the computed flow in the PDMP study.
- The Eldorado Private School located at the southwest corner of 96th Street and Larkspur improved Wash-2A and 2B as labeled in Figure 4, and also identified Q_{100} flows at concentration points C-16 and C-17.
- Channel bottom erosion and sediment and debris deposition in Wash-2 north of Cactus Road, observed during field investigation and as can be seen in Pic 2.6 and 2.7, is caused by the restrictive conveyance of storm flows through an older development area approximately ¼ mile to the north.
- Drainage structures constructed with new developments across the study area have effectively controlled and diverted locally generated flows to specific discharge points to prevent erosion in most cases. This is not true in most of the older developed areas.
- Local and regional agencies have constructed and maintained discontinuous segments of equestrian and footpaths throughout the project area.

XIII. CONCLUSION

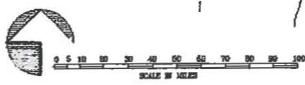
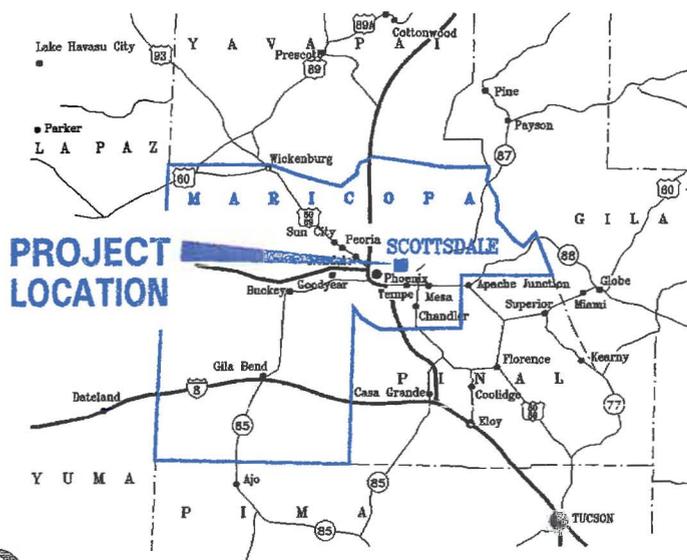
- Various local drainage channels and structures require immediate maintenance, including debris and sediment removal, to restore channel capacities and prevent local flooding.
- Visual observations of some structures within the main drainage channels appear not to have adequate capacity to convey the design flows established in the PDMP report.
- Most new developments in the north and the south end of the project have adhered to the retention requirements assumed in the PDMP study. The area bounded by Larkspur Drive, Cactus Road, 92nd Street and 100th Street have not met this requirement.
- Bike paths have been constructed in the north portion and a portion from Shea Boulevard to 92nd Street. Concrete and asphalt footpaths have been constructed with a lack of continuity at various locations, especially in the new developments within the project. It appears to be feasible to construct a bike path with some continuity within the project limits with a detail analysis of easements and drainage conveyance of the subject area.
- Field investigation revealed that a portion of the channel from Larkspur Drive to Cactus Road has not been improved as suggested by the PDMP report.
- Although the PDMP report showed a split flow at concentration point C-23 in Figure 4, it may be possible to reduce the storm flows in Wash-2 downstream of Sweetwater Avenue (Figure 4; @ C-23) by conveying the flows east towards the Larkspur detention basin.
- Utilizing the existing topographic information, combined with field investigation of structure sizes and slope, the hydrologic/hydraulic values for this drainage basin contained within the PDMP study can be updated to a DCR level.



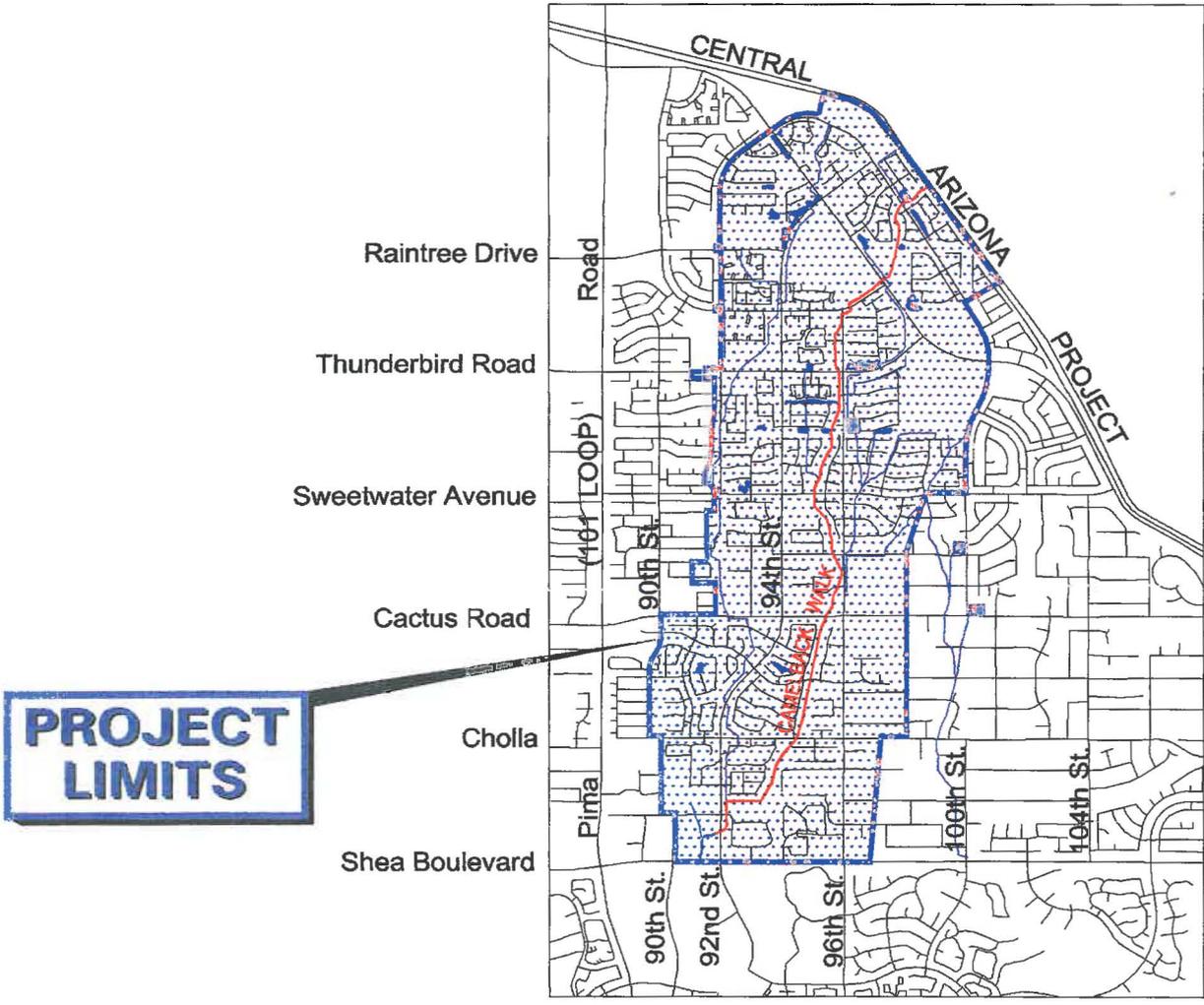
XIV

APPENDIX A

MAPS



ARIZONA



PROJECT LIMITS



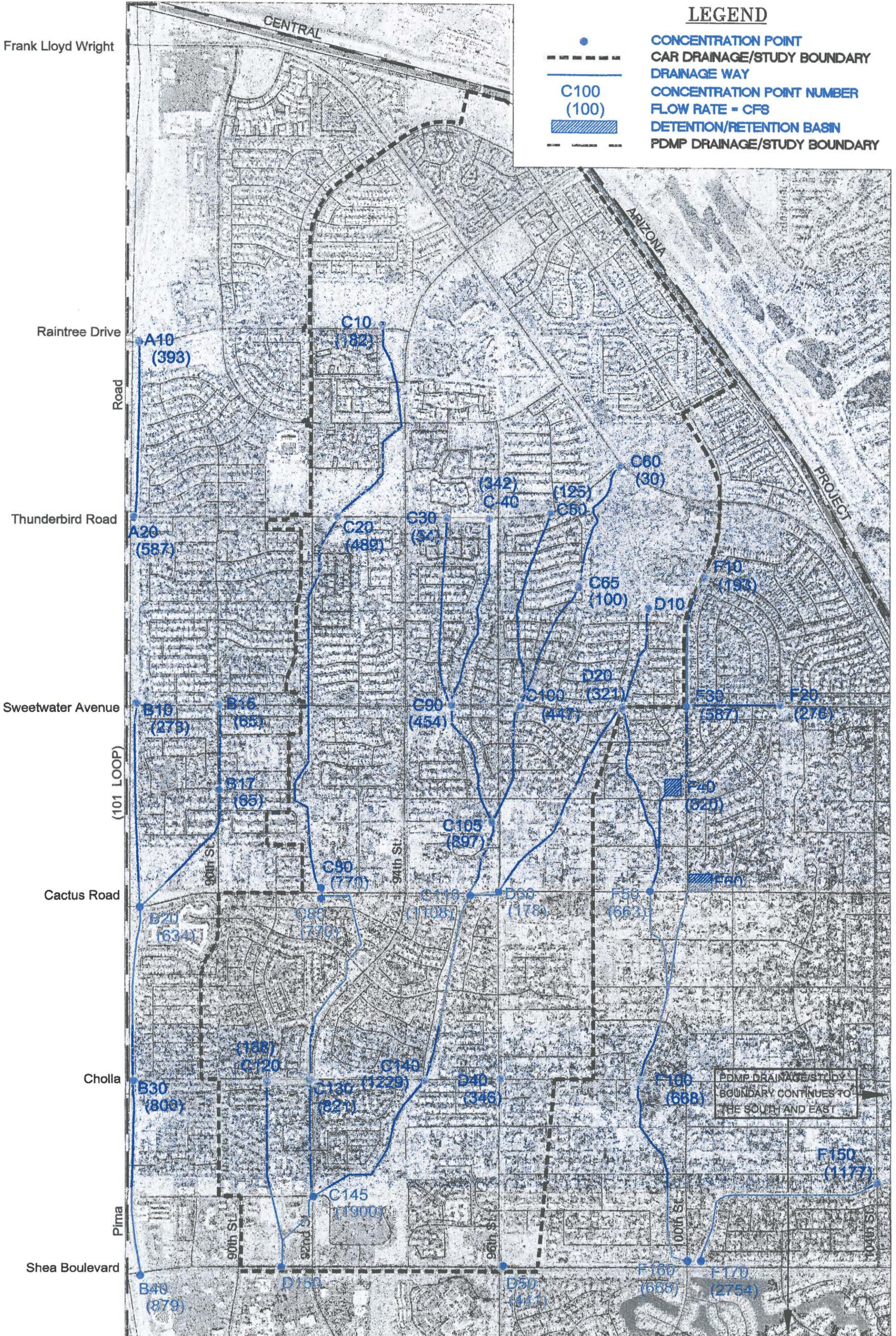
City of Scottsdale
 Upper Camelback Walk
 Flood Control Improvements
 PROJECT LOCATION MAP



Frank Lloyd Wright

LEGEND

- CONCENTRATION POINT
- CAR DRAINAGE/STUDY BOUNDARY
- DRAINAGE WAY
- C100
(100) CONCENTRATION POINT NUMBER
FLOW RATE - CFS
- ▨ DETENTION/RETENTION BASIN
- PDMP DRAINAGE/STUDY BOUNDARY



City of Scottsdale
 Upper Camelback Walk
 Flood Control Improvements
 Pima/Doubletree Master Drainage Plan



WILLDAN
 Serving Public Agencies

Drainage Report No.	Drainage Report Title	Prepared By	Date Prepared
1	94th Street, Cactus Road to Sweetwater Avenue	Alpha Engineering Group	13-Mar-92
2	92nd Street and Cactus Road	Landmark Consultants, Inc.	Dec, 1994
3	92nd Street Paving Projects S0718/S0719	AMWEST Engineering	17-Jul-91
4	Pima/Doubletree Area Master Drainage Plan	Boyle Engineering Corp	Nov, 1989
5	Montage	Development Engineering, Inc.	14-Sep-93
6	Sonoran Vista	Clouse Engineering, Inc.	25-Jan-96
7	Mirada at Scottsdale Horizon Residential Subdivision	American Engineering	Feb, 1994
8	Foothill Shadows	D.N.A., Inc.	Sep, 1987
9	Desert Rose	Clouse Engineering, Inc.	4-Dec-89
10	Cabo Del Rey	PRC-Engineering, inc.	April, 1986
11	Shea Business Park	WBC Consultants, Inc.	Oct, 1980
12	Eldorado Private School	Clouse Engineering, Inc.	29-Mar-88
13	Vista Parc	Clouse Engineering, Inc.	5-Jul-88
14	Scottsdale Vista No.2	Clouse Engineering, Inc.	Sep, 1978
15	Mission Del Arroyos	D.N.A., Inc.	June, 1987
16	Pima Freeway - Shea Boulevard to 90th Street	Wood/Patel Associates	31-Jul-97
1	Desert Shadows	Clouse Engineering, Inc.	1-Nov-90
2	Desert Sage Unit II		
3	Scottsdale Foothills (157-DR-85)		
4	Las Hadas (197-DR-85)		
5	The Retreat	Clouse Engineering, Inc.	Jan, 1985
6	Hydrologic & Hydraulic Reports for Palos Verdes	Clouse Engineering, Inc.	March, 1985
7	Scottsdale Hills		
8	Encantada		
9	Desert Shadows III		
10	Sweetwater Ranch Manor		
11	Camelot Ranch		
12	Vista Del Rincon		
13	Costa Verde		
14	Scottsdale Horizon Parcels L & M		
15	Sweetwater Ranch Estates Unit III		
16	Sweetwater Ranch Manor Unit III		
17	Larkspur Manor		
18	Sweetwater Ranch Estates Unit II		
19	Sagewood		
20	Country Trace Two		
21	Scottsdale Mountain View Estates Unit II		
22	Manzanita Villas		
23	Berryessa		
24	Trailside at Manzanita Ranch		
25	Scottsdale Vista		
26	Mission SantaFe		
27	La Contessa		
28	San Carlos		
29	Ladera Vista		
30	Sweetwater Ranch Village at Sweetwater Ranch		
31	Sweetwater Ranch Foothills at Sweetwater Ranch		
32	Highlands Luxury Apartments		
33	Scottsdale Vista North Townhomes		
34	Luthern Church		
35	Walgreens		
36	San Marcos		
37	Existing School		
38	Sweetwater Estates		
39	92nd Street & Raintree	Clouse Engineering, Inc.	16-Jul-93

Reviewed Drainage Reports

Not Found/Subdivision Names Found During Site Visits

Table 1: Reviewed/Not Found Drainage Report List

Frank Lloyd Wright

Raintree Drive

Road

Thunderbird Road

Sweetwater Avenue

(101 LOOP)

Cactus Road

Cholla

Pima

Shea Boulevard

LEGEND



DRAINAGE STUDIES REVIEWED



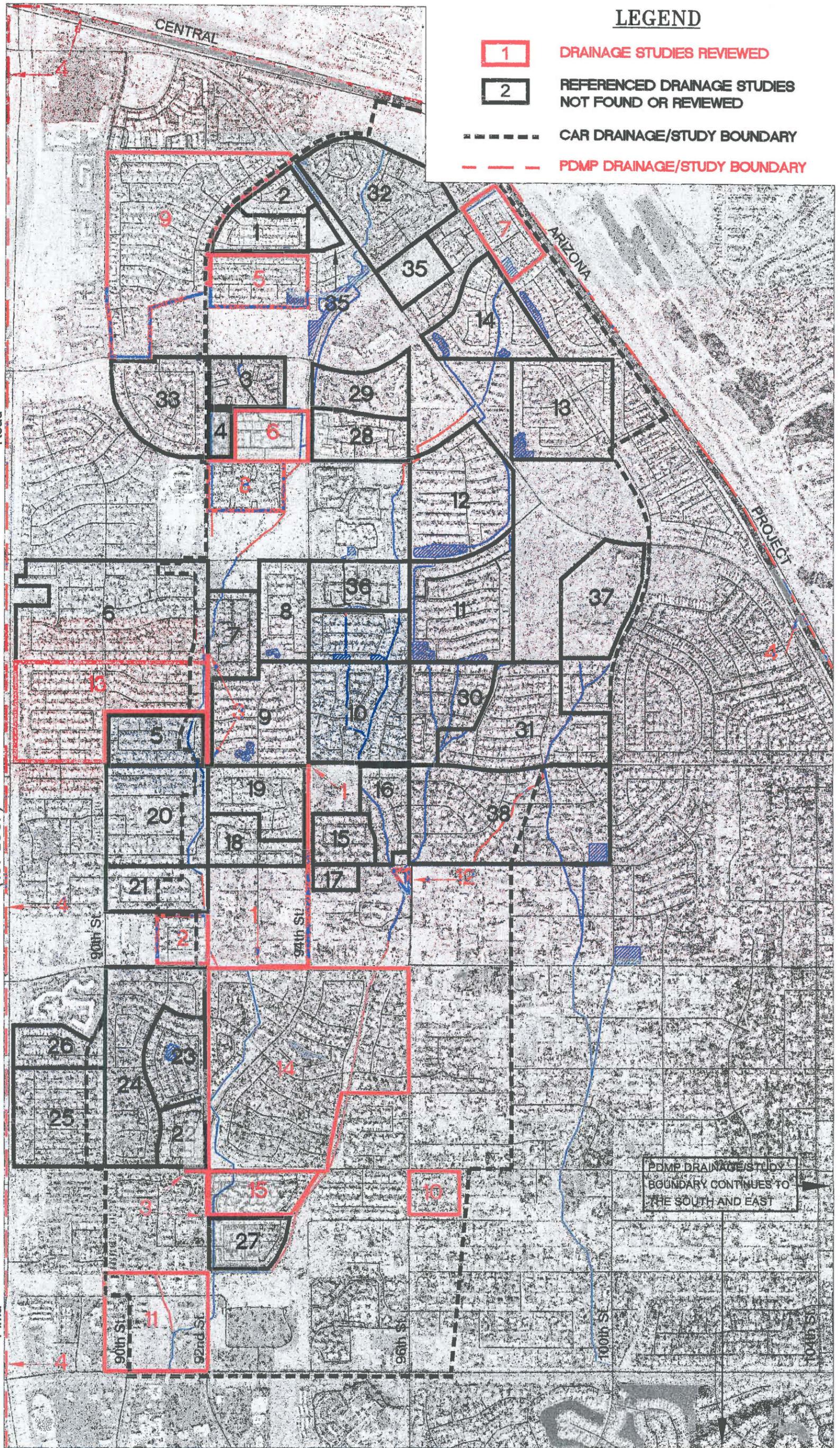
REFERENCED DRAINAGE STUDIES NOT FOUND OR REVIEWED



CAR DRAINAGE/STUDY BOUNDARY



PDMP DRAINAGE/STUDY BOUNDARY



City of Scottsdale
 Upper Camelback Walk
 Flood Control Improvements
 Reviewed/Reference Drainage Report Locations



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Frank Lloyd Wright

Raintree Drive

Thunderbird Road

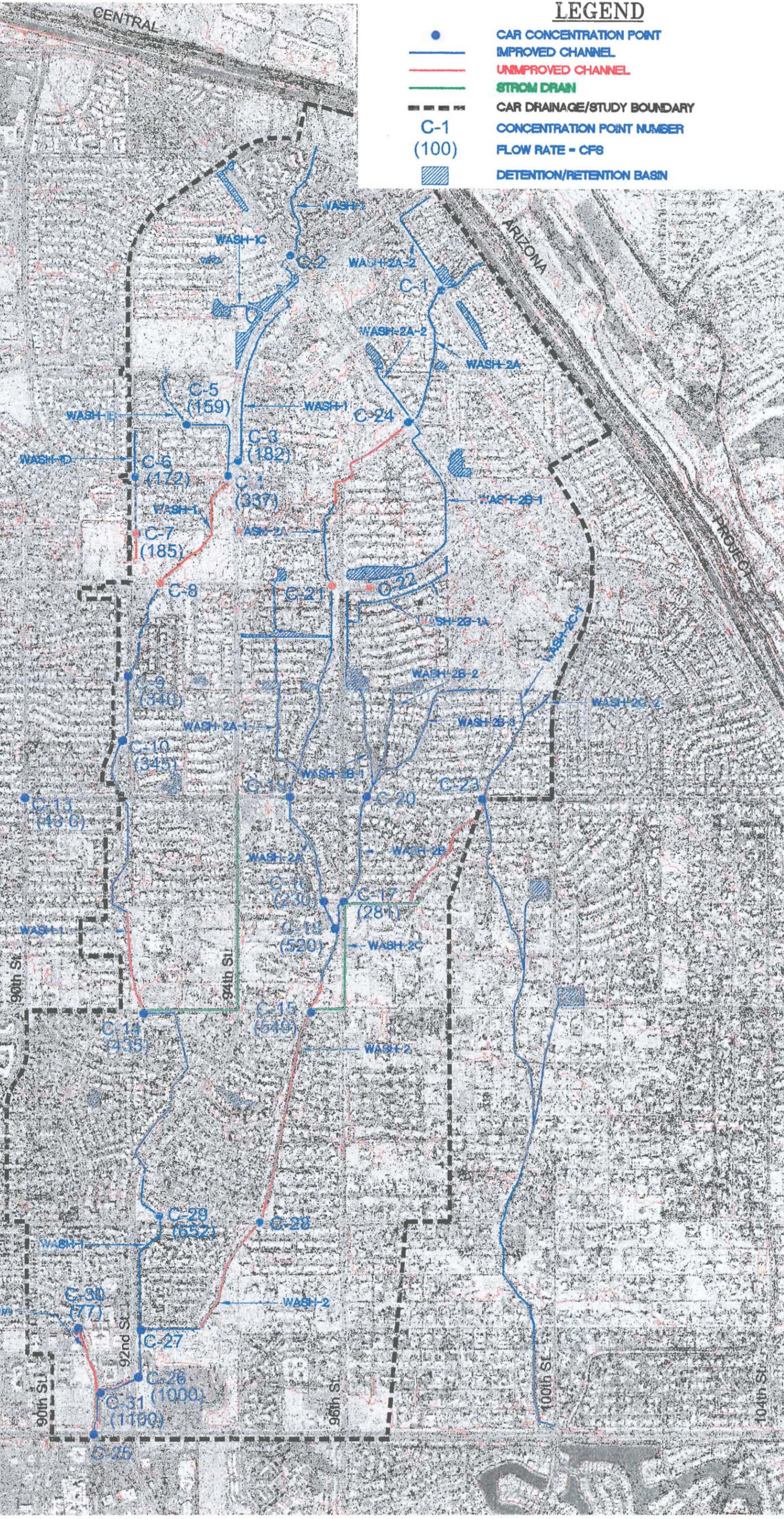
Sweetwater Avenue

Cactus Road

Cholla

Shea Boulevard

(101 LOOP)



LEGEND

- CAR CONCENTRATION POINT
- IMPROVED CHANNEL
- UNIMPROVED CHANNEL
- STORM DRAIN
- - - - CAR DRAINAGE/STUDY BOUNDARY
- C-1
(100) CONCENTRATION POINT NUMBER
FLOW RATE - CFS
- ▨ DETENTION/RETENTION BASIN



City of Scottsdale
Upper Camelback Walk
Flood Control Improvements
Existing Drainage Plan



WILLDAN
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Frank Lloyd Wright

Raintree Drive

Road

Thunderbird Road

Sweetwater Avenue

(101 LOOP)

Cactus Road

Cholla

Pima

Shea Boulevard

CENTRAL

ARIZONA

PROJECT

LEGEND



PHOTO NUMBER AND DIRECTION OF PHOTO



LOCATION OF PHOTO TAKEN



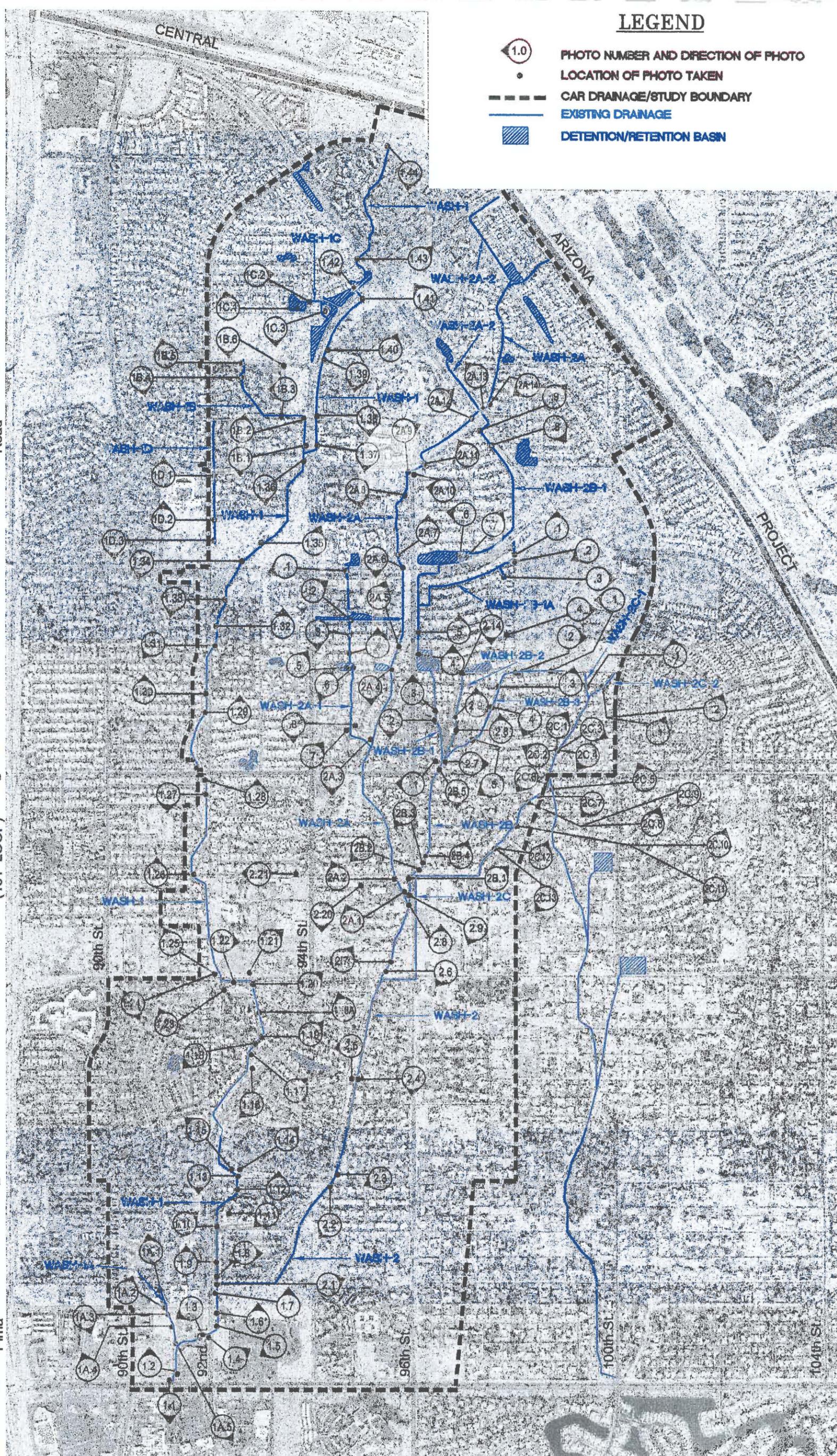
CAR DRAINAGE/STUDY BOUNDARY



EXISTING DRAINAGE



DETENTION/RETENTION BASIN



City of Scottsdale
 Upper Camelback Walk
 Flood Control Improvements
 Photo Index Plan



Frank Lloyd Wright

LEGEND

- 1.0 STRUCTURE NUMBER
- o LOCATION OF STRUCTURE
- CAR DRAINAGE/STUDY BOUNDARY
- EXISTING DRAINAGE
- DETENTION/RETENTION BASIN

Raintree Drive

Road

Thunderbird Road

Sweetwater Avenue

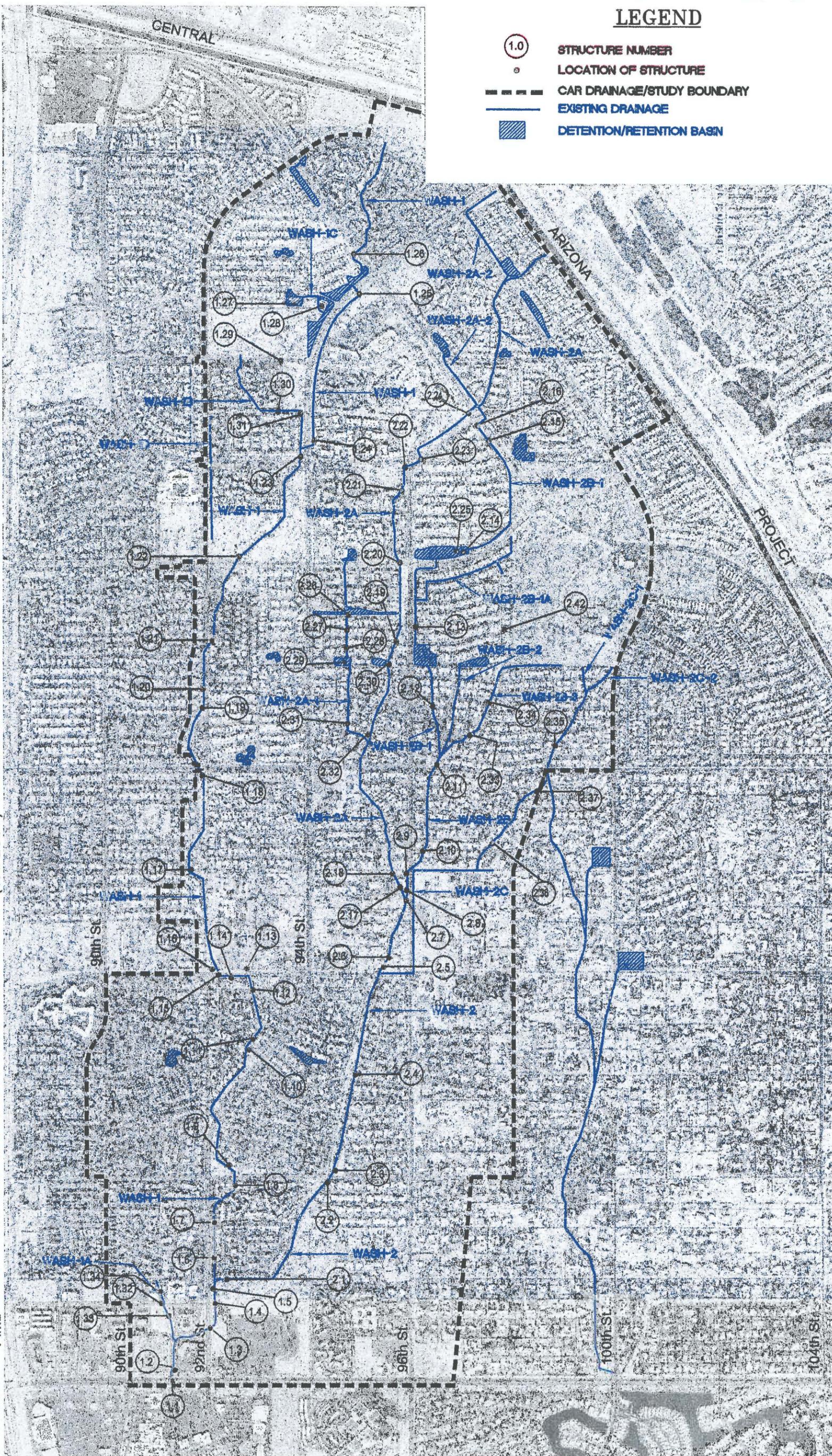
(101 LOOP)

Cactus Road

Cholla

Pima

Shea Boulevard



City of Scottsdale
Upper Camelback Walk
Flood Control Improvements
Structure Id Plan



WILLDAN
 Serving Public Agencies

Table 2 : Wash-1

Structure Id No.	Structure Description	Design Capacity cfs	Ownership (Assessor Parcel No.)	Maintained By:	Existing Condition
1.1	Box culvert/walk-way bridge crossing Shea Blvd.		City of Scottsdale	City of Scottsdale	Clean
1.2	Camelback Wash		City of Scottsdale (217-25-584)	City of Scottsdale	Flows appear to pond along the west side of the wash, where it's partially covered with trees and brush.
1.3	4- 5' by 8' box culvert crossing 92nd Street		City of Scottsdale	City of Scottsdale	The downstream end, especially the 2-barrels on the north side are 3/4's obscured with brush and construction material.
1.4	5-barrel 71" BY 47" CMPA pipes crossing the entrance to the Cemetery.	620-cfs (per Willdan Calcs)	Private Owner (217-25-846D)	N/A	The pipes are clear of any obstructions.
1.5	Trapezoidal earthen channel with 4H:1V side-slopes		Private Owner (217-25-846D)	N/A	Appears to be clear of any debris, except for some weed along the banks and some sediment deposit on the bottom.
1.6	2-barrel box culvert crossing the entrance to La Contessa subdivision		Property owners of La Contessa	Home Owners Association	Storm flows appear to pond downstream of the structure due to channel inverts been raised approximately 1-foot.
1.7	4-barrel CMP pipe crossing the entrance to Mission Del Arroyos		LCI Properties, Inc. (217-48-938)	LCI Properties, Inc. (Rec. 88-286180)	Storm flows appear to pond downstream of the structure due to sediment deposit.
1.8	2- 10' by 3' box culverts crossing Cholla	435	City of Scottsdale	City of Scottsdale	Appears to be clear of any debris, except for some sediment deposit on the bottom.
1.9	48-foot wide top width, 16-foot wide bottom width, 4-foot deep with 4H:1V side slope earthen trapezoidal channel	934	City of Scottsdale (217-25-506)	City of Scottsdale	Appears to be partially covered with debris and sediment deposit.
1.10	5- 50" by 31" elliptical CMP pipe crossing Poinsettia Drive (downstream).	435	City of Scottsdale (217-25-334B)	City of Scottsdale	The pipes and the downstream energy dissipator structure are clear of debris.
1.11	5- 50" by 31" elliptical CMP pipe crossing Poinsettia Drive (upstream).	435	City of Scottsdale (217-25-334B)	City of Scottsdale	There appears to be sediment deposited just upstream of the pipes.
1.12	5- 50" by 31" elliptical CMP pipe crossing Laurel Lane (downstream).	435	City of Scottsdale (217-25-334B) DKT. 13607, Pg. 311	City of Scottsdale	The pipes appear to be clear of any debris, but the channel bottom has been eroded approximately 200-feet downstream of the structure.
1.13	3- 50" by 31" elliptical CMP pipe crossing Cactus Road (upstream).		City of Scottsdale	City of Scottsdale	The pipes appear to be partially filled with sediment and debris.
1.14	Trapezoidal earthen channel with 4H:1V side-slopes		217-25-828 (esmt); 217-25-829; 217-25-830; 217-25-831		The channel is clear of any debris, sediment deposit, and no imminent erosion along the channel banks or the bottom.
1.15	3-CMP pipes crossing Cactus Road		City of Scottsdale	City of Scottsdale	The pipes are clear of any obstructions, but it appears some sediment deposition just downstream of the structure.
1.16	Block-wall opening		217-24-016B		The openings appear to be partially obstructed with debris.
1.17	3-box culverts crossing Larkspur Drive.		City of Scottsdale	City of Scottsdale	The culverts are clear of any debris or sediment deposition.

Table 2 : Wash-1

Structure Id No.	Structure Description	Design Capacity cfs	Ownership (Assessor Parcel No.)	Maintained By:	Existing Condition
1.18	2-box culverts crossing Sweetwater Avenue		City of Scottsdale	City of Scottsdale	The culverts are clear of any debris or sediment deposition.
1.19	3- 10' by 3' box culvert crossing Pershing Avenue	345	217-24-016B		The culverts are clear of any debris or sediment deposition.
1.20	30-foot wide bottom width, 77-foot wide top width, 4H:1V side slopes graded earthen channel	345 (@ 2.2-feet depth)	City of Scottsdale	City of Scottsdale	The channel is clear of any debris, sediment deposit, and no imminent erosion along the channel banks or the bottom.
1.21	2- 10' by 3' box culverts crossing 92nd Street	520	City of Scottsdale	City of Scottsdale	The culverts are clear of any debris or sediment deposition.
1.22	2- 8' by 3' box culvert crossing Thunderbird Road	169 (per Willdan Calcs)	City of Scottsdale	City of Scottsdale	The channel upstream of the structure does not appear to be well graded. The loose gravel may deposit sediment downstream.
1.23	Box culvert crossing Redfield Road				The culvert is clear of any debris or sediment deposition.
1.24	Box culvert crossing 94th Street				The culvert is clear of any debris or sediment deposition.
1.25	Box culvert/walk-way bridge crossing Thompson Peak Pkwy.		Dedicated to the City of Scottsdale	Property Owner; Bicycle Underpass Easement; Bk 337, Pg 30, M.C.R.	The structure is clear of any debris or sediment deposition.
1.26	Box culvert/walk-way bridge crossing Frank Lloyd Wright.		Dedicated to the City of Scottsdale	Home Owners Association	The structure is clear of any debris or sediment deposition.
1.27	Approximately 131,588-CF retention basin 3-feet in depth located within the Montage development	3.02 Ac-ft	Dedicated to the Public	Home Owners Association	The facility is clear of any debris or sediment deposition.
1.28	Block-wall opening approximately 6-foot wide and 1-foot high at the end of the cul-de-sac on 94th Place.	80-cfs @ 2% slope (per Willdan Calcs)			The opening appear to be clear of any obstructions.
1.29	2-barrel RCP pipes approximately 24-inch diameter crossing Raintree Drive.	50-cfs @ 0.006'/ft (per Willdan Calcs)			No outlet on the south side of the street could be found.
1.30	Trapezoidal rip-rap lined channel approximately 20-feet wide and 5-foot bottom width with 3H:1V side-slopes within the Sonoran Vista development.	160-cfs			The facility is clear of any debris or sediment deposition.
1.31	3-36-inch RCP pipes crossing the north entrance to the Sonoran Vista development.	160-cfs			The structure is clear of any debris or sediment deposition.
1.32	2-24-inch RCP Pipes crossing Desert Cove.	78-cfs	City of Scottsdale	City of Scottsdale	The structure is partially covered with debris and sediment.
1.33	Trapezoidal channel approximately 3H:1V side slopes south of Desert Cove.	121-cfs	217-25-574 (East side of channel); 217-25-575 (West side of channel)		The channel is partially covered with brush and debris impeding the storm flows.
1.34	Trapezoidal channel approximately 3H:1V side slopes north of Desert Cove with rip-rap lined banks and bottom just north of the 2-pipes.	121-cfs			The channel is partially covered with brush and debris especially the north end.

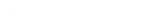
Table 3 : Wash-2

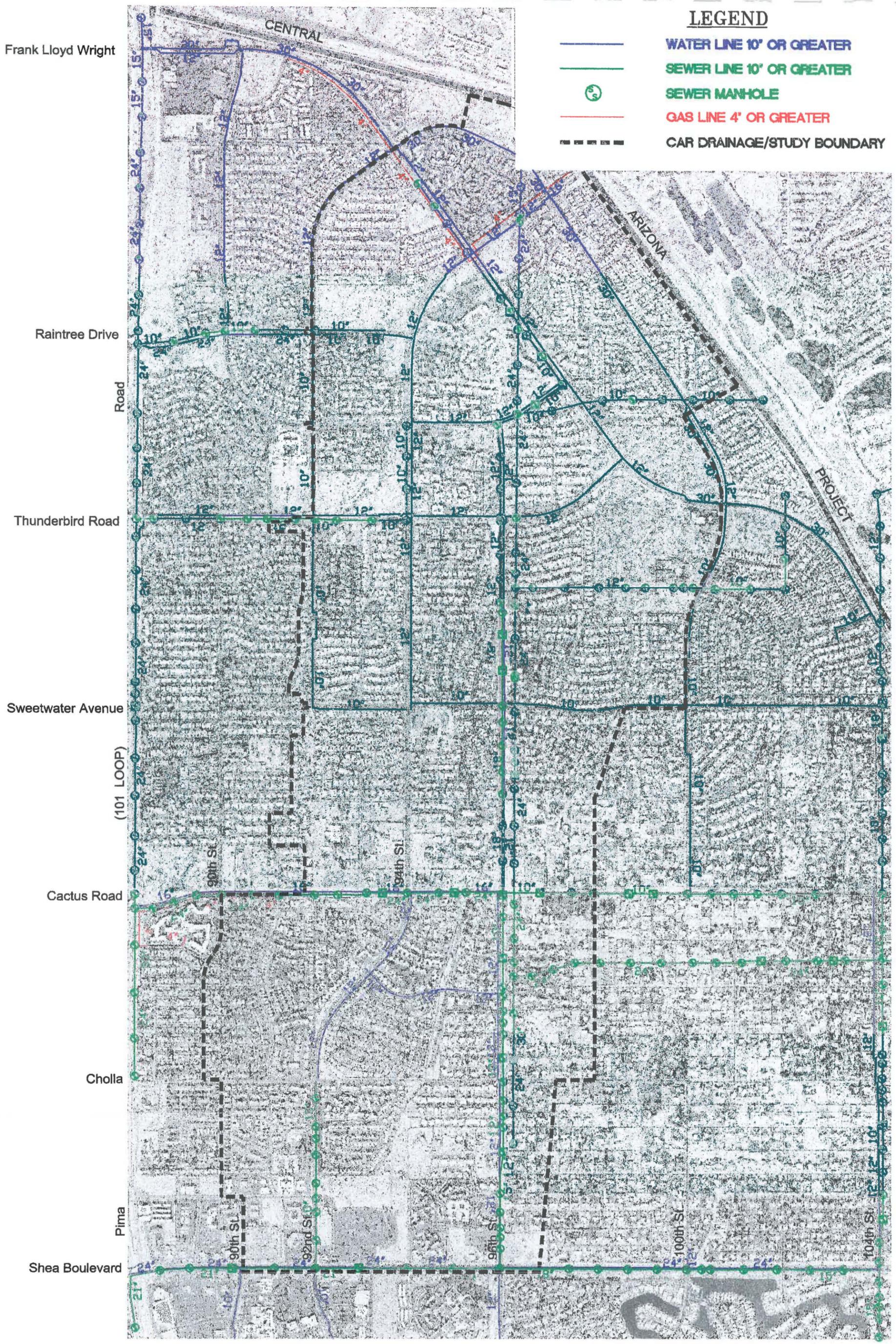
Structure Id No.	Structure Description	Design Capacity cfs	Ownership (Assessor Parcel No.)	Maintained By:	Existing Condition
2.1	Rectangular channel with gabion lined banks		Property owners of La Contessa	Home owners Association.	The channel appears to be clear of any debris.
2.2	Approximately 50 to 70-foot wide earthen channel with 4H:1V side slopes.		LCI Properties, Inc.	Home owners Association (Rec. 88-286180)	The channel appears to be partially covered with brush, but no major obstructions to flow.
2.3	3- 10' by 3' box culvert crossing Cholla & 94th Way.	549	City of Scottsdale.	City of Scottsdale.	For the most part the structure is clear of any debris or sediment deposit.
2.4	3-barrel box culvert crossing Poinsettia Drive.		City of Scottsdale.	City of Scottsdale.	The culverts are clear of any debris or sediment deposition, yet the channel bottom just upstream of the structure is covered with brush.
2.5	6- 31" by 50" elliptical CMP pipes crossing Cactus Road.	549	City of Scottsdale.	City of Scottsdale.	The pipes appear to be covered with debris for the most part, and also sediment appears to be deposited just upstream of the structure.
2.6	Appears to be a trapezoidal earthen channel		217-24-023 R; 217-24-182 B; 217-24-183 A.		The channel bottom appears to have been subjected to severe erosion.
2.7	6-barrel approximately 39-inch CMP pipe crossing Oak Drive (downstream).		El Paseo Estates Community Association (217-60-090 & 091)	El Paseo Estates Community Association.	Downstream of the pipes appear to be partially obstructed with trees, weeds and debris.
2.8	6-barrel approximately 39-inch CMP pipe crossing Oak Drive (upstream).		El Paseo Estates Community Association (217-60-090 & 091)	El Paseo Estates Community Association.	The pipes and the channel upstream of the pipes appear to be clear of any debris compared to structure No.2.7.
2.9	2- 10' by 3' box culverts crossing the intersection of 96th Street and Larkspur Drive.	281	City of Scottsdale.	City of Scottsdale.	The culverts are clear of any debris or sediment deposition.
2.10	Walkway/equestrian/drainage easement		Private w/ Public Drainage Easement; Dedicated to the Public.	Developer or Assignee.	The channel is clear of any debris, sediment deposit, and no imminent erosion, except for some ponding north of Larkspur Drive.
2.11	2-barrel box culvert crossing Sweetwater Avenue.		City of Scottsdale.	City of Scottsdale.	The structure is clear of any debris or sediment deposition.
2.12	Graded trapezoidal earthen channel		217-23-485	Home Owners Association	The channel is clear of any debris or erosion.
2.13	Graded trapezoidal earthen channel		217-50-230; 217-50-231; Dedicated to the City of Scottsdale.	Home Owners Association	The channel is clear of any debris or erosion.
2.14	Box-culvert crossing 97th Place.				The structure is clear of any debris or sediment deposition.
2.15	Graded trapezoidal earthen channel with landscaping along the banks.				The channel is clear of any debris or erosion.
2.16	2- approximately 24-inch RCP pipes crossing Frank Lloyd Wright.				The pipes appear to be clear of any debris or sediment deposit.
2.17	Trapezoidal channel 30-foot top width, 12-foot bottom width, total depth of approximately 3-feet, and 3H:1V side-slopes	230	217-24-970; 217-24-971		The channel appears to be clear of any debris or erosion.
2.18	5- 24-inch RCP pipes crossing Larkspur Drive.	230	City of Scottsdale.	City of Scottsdale.	2 pipes appear to be clear of any debris or sediment deposit, but the 3 western most pipes are partially obscured with debris..

Table 3 : Wash-2

Structure Id No.	Structure Description	Design Capacity cfs	Ownership (Assessor Parcel No.)	Maintained By:	Existing Condition
2.19	Walkway/equestrian/drainage easement				The channel appears to be clear of any debris or sediment deposition.
2.20	Box-culvert crossing Thunderbird Road.				The structure is clear of any debris or sediment deposition.
2.21	Graded earthen channel/fence opening				It appears that most of the channel is covered with brush, and the fence opening is obscured with debris.
2.22	2-barrel box culvert crossing 96th Street.				The structure appears to be clear of any debris or sediment deposition, except just downstream of the structure.
2.23	2-barrel box culvert crossing Redfield Road.				The culvert is clear of any debris or sediment deposition.
2.24	3- 24-inch RGRCP pipes, and box-culvert.				The pipes and the culvert are clear of any debris or sediment deposition.
2.25	Detention Basin within the Vista Del Rincon development				The basin appears to be clear of any debris or sediment deposition.
2.26	24-inch RCP outletting flows the retention basin within the San Marcos development.				The pipe is clear of any debris.
2.27	Concrete lined trapezoidal channel within the Casa Privada development.		Dedicated to the City of Scottsdale.	Home Owners Association.	The trapezoidal channel is clear of any debris or sediment deposition.
2.28	Concrete lined trapezoidal channel within the Casa Privada development south Voltaire Drive.		Dedicated to the City of Scottsdale.	Home Owners Association.	The trapezoidal channel is clear of any debris or sediment deposition.
2.29	3-approximately 36-inch RCP's crossing Presidio Road within the Casa Privada development.		Dedicated to the City of Scottsdale.	Home Owners Association.	There appears to be sediment deposited at the downstream end of the structure.
2.30	Drainage easement/equestrian trail.		Dedicated to the City of Scottsdale.	Home Owners Association.	For the most part it appears to be clear of any debris, except for the ponding along the walkway.
2.31	Rip-rap lined trapezoidal channel within the Sweetwater Ranch Manor development with approximately 3H:1V side slopes				The channel appears to be clear of any debris.
2.32	Graded earthen trapezoidal channel with equestrian trail within the Sweetwater Ranch Manor development.				The channel appears to be clear of any debris.
2.33	Drainage easement/equestrian trail within Sweetwater Ranch Village at Sweetwater Ranch.		Dedicated to the Public	Sweetwater Ranch Village Home Owners Association.	The easement appears to be clear of any debris.
2.34	Trapezoidal earthen channel within Sweetwater Ranch Village @ Sweetwater Ranch development along the west side of 97th Street.		Dedicated to the Public	Sweetwater Ranch Village Home Owners Association.	The channel appears to be clear of any debris, except for large trees planted along the banks of the channel.
2.35	Drainage/equestrian easement within Sweetwater Ranch Foothills @ Sweetwater Ranch.		Dedicated to the Public	Sweetwater Ranch Village Home Owners Association.	The easement appears to be clear of any obstructions to storm flow.
2.36	Drainage/equestrian easement within the Sweetwater Ranch Foothills development.				The easement appears to be clear of any obstructions to storm flow.
2.37	Trapezoidal earthen channel within Sweetwater Estates development with approximately 4H:1V side slopes and 20-foot bottom width.		Dedicated to the Public	Developer or Assignee.	The channel appears to be clear of any debris or sediment deposition.
2.38	Drainage easement approximately 50-feet wide with 6-foot walls on either side within the Camelot Ranch development		Dedicated to the City of Scottsdale.	Home Owners Association.	The easement appears to be clear of any debris.

LEGEND

-  WATER LINE 10' OR GREATER
-  SEWER LINE 10' OR GREATER
-  SEWER MANHOLE
-  GAS LINE 4' OR GREATER
-  CAR DRAINAGE/STUDY BOUNDARY



City of Scottsdale
Upper Camelback Walk
Flood Control Improvements
Utility Plan



WILLDAN
 Serving Public Agencies

LEGEND

- ZONING LIMITS
- RI-5 ZONING
- - - - CAR DRAINAGE/STUDY BOUNDARY

Frank Lloyd Wright

Raintree Drive

Thunderbird Road

Sweetwater Avenue

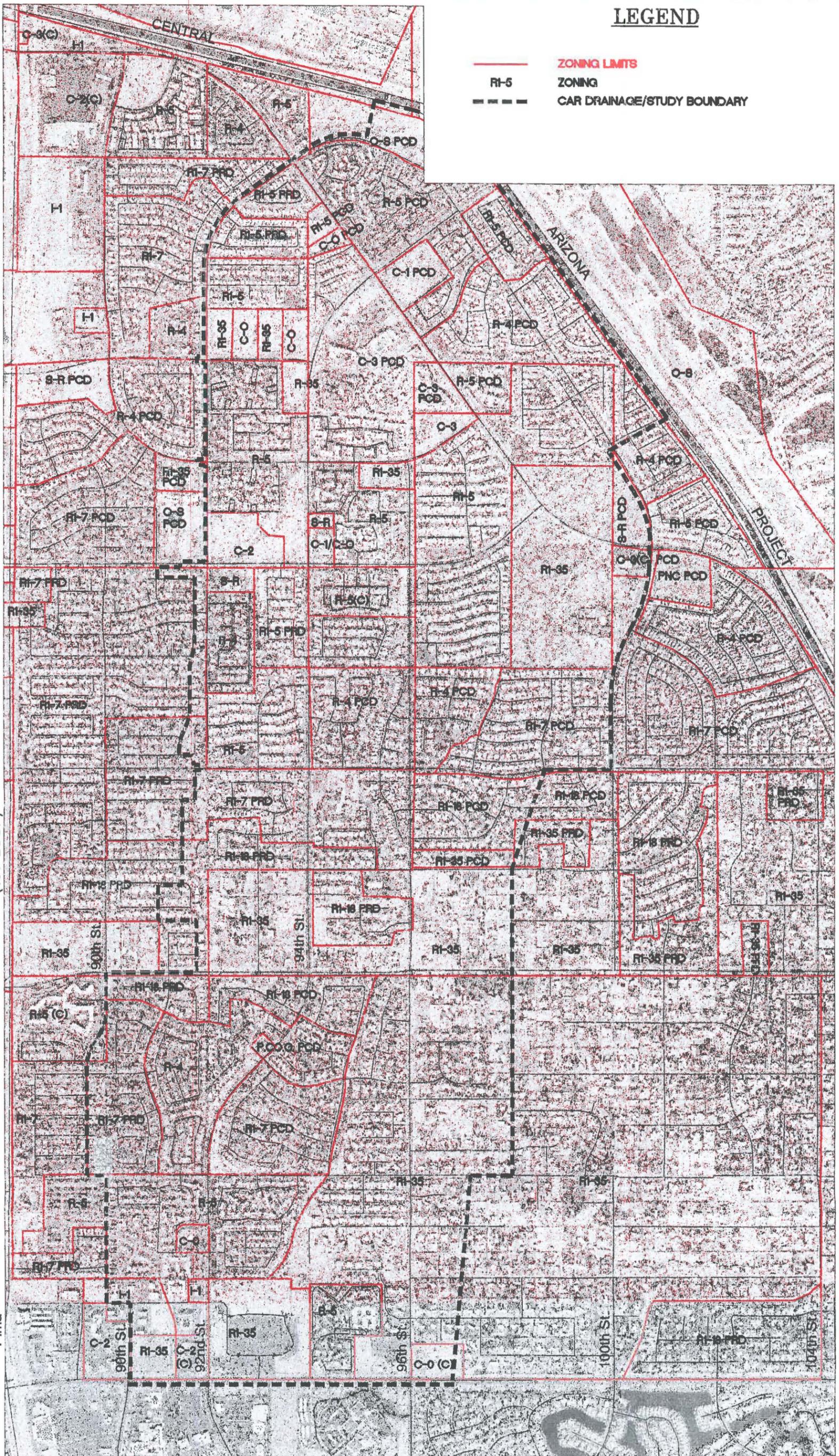
(101 LOOP)

Cactus Road

Cholla

Pima

Shea Boulevard



City of Scottsdale
Upper Camelback Walk
Flood Control Improvements
Zoning Plan



WILLDAN
Serving Public Agencies

Frank Lloyd Wright

LEGEND

-  DRAINAGE PARCEL
-  DRAINAGE EASEMENT
-  CAR DRAINAGE/STUDY BOUNDARY
-  EXISTING DRAINAGE

Raintree Drive

Road

Thunderbird Road

Sweetwater Avenue

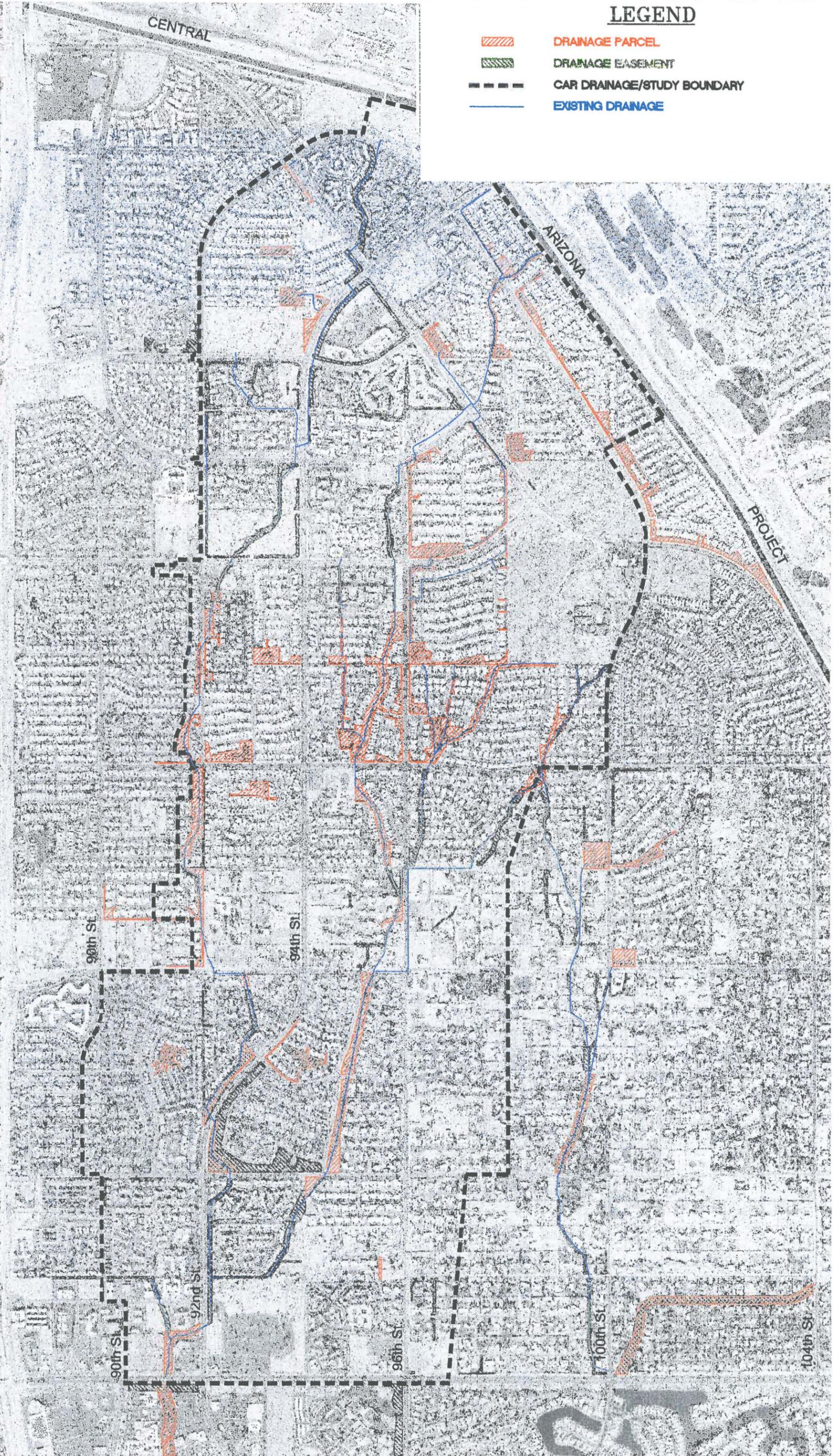
(101 LOOP)

Cactus Road

Cholla

Pima

Shea Boulevard



City of Scottsdale
Upper Camelback Walk
Flood Control Improvements
Drainage Easements/Parcels



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Serving Public Agencies



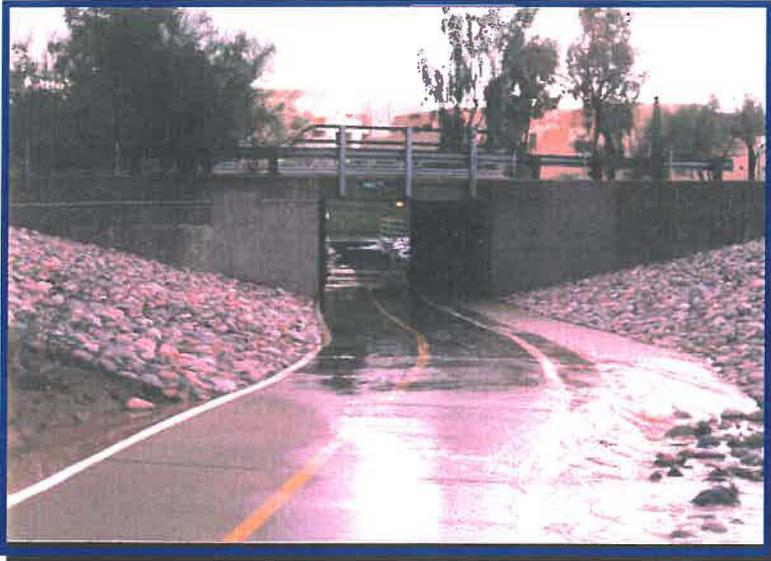
XV

APPENDIX B

PICTURES

APPENDIX B-1

**PICTURES
WASH NO.1**



Pic 1.1:

**Box culvert crossing
Shea Boulevard, along
Camelback Walk.**



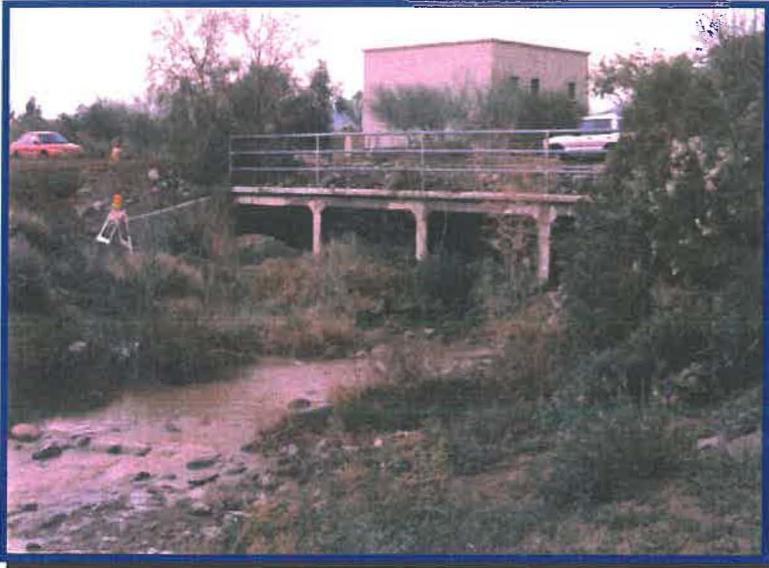
Pic 1.2:

**Camelback Walk
looking Upstream of
Shea Boulevard.**



Pic 1.3:

**Camelback Walk looking
downstream of 92nd Street.**



Pic 1.4:

4 Barrel Box Culverts
Crossing 92nd Street at the
downstream end.
The Culvert crossing is
obscured with brush and
construction material.



Pic 1.5:

4 Barrel Box Culverts
Crossing 92nd Street at the
upstream end with wing
walls.



Pic 1.6:

Discharge of 5 Barrel
Elliptical Pipe Crossing at
the entrance-way to the
Cemetery.



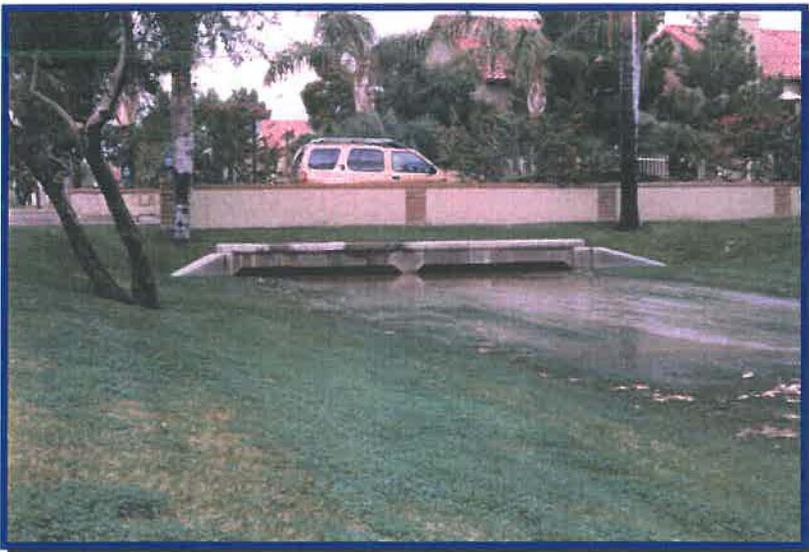
Pic 1.7:

Graded Earth Channel
along the east side of 92nd
Street looking upstream.



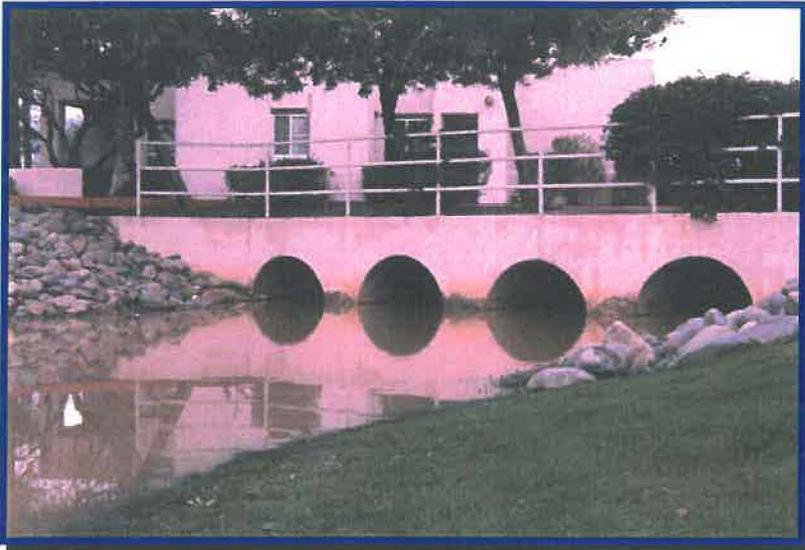
Pic 1.8:

Looking upstream at the
confluence of Wash-1 and
Wash-2.



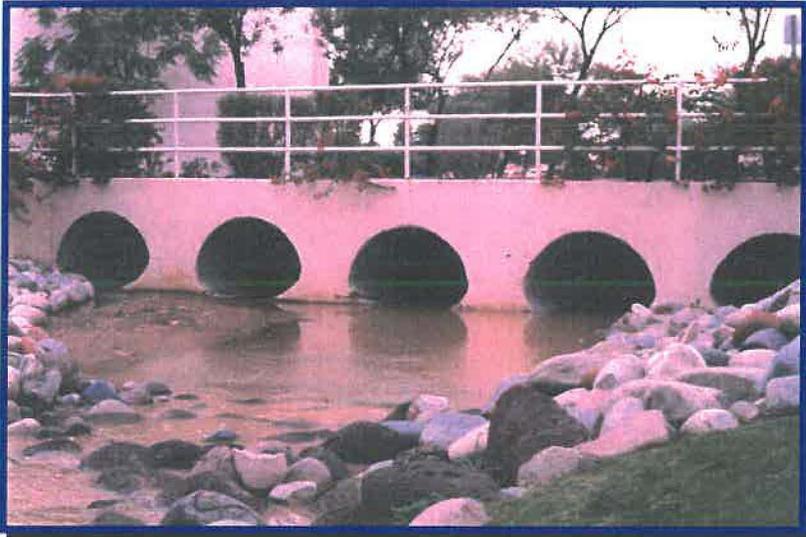
Pic 1.9:

Looking upstream at the
grass-lined trapezoidal
channel and 2-barrel box
culvert crossing the
entrance to La Contessa.
Channel invert has been
raised approximately 1-
foot blocking discharge
from box culvert



Pic 1.10:

Looking upstream at the grass-lined channel with rip-rap banks and 4-barrel circular CMP pipe crossing the entrance to Mission Del Arroyos.



Pic 1.11:

Looking upstream at the channel with rip-rap banks and 5-barrel CMP pipe crossing Mission Del Arroyos Apartment Complex on-site.



Pic 1.12:

The 2 Barrel Box culvert crossing Cholla approximately 300-feet east of 92nd Street at Mission Del Arroyos. Picture taken looking upstream.



Pic 1.13:

2- Barrel Concrete Box Culvert crossing Cholla, looking downstream with concrete lined banks.



Pic 1.14:

Concrete valley gutter approximately 30-feet wide conveying flows to Wash-1 from the Scottsdale Vista No.2 subdivision.



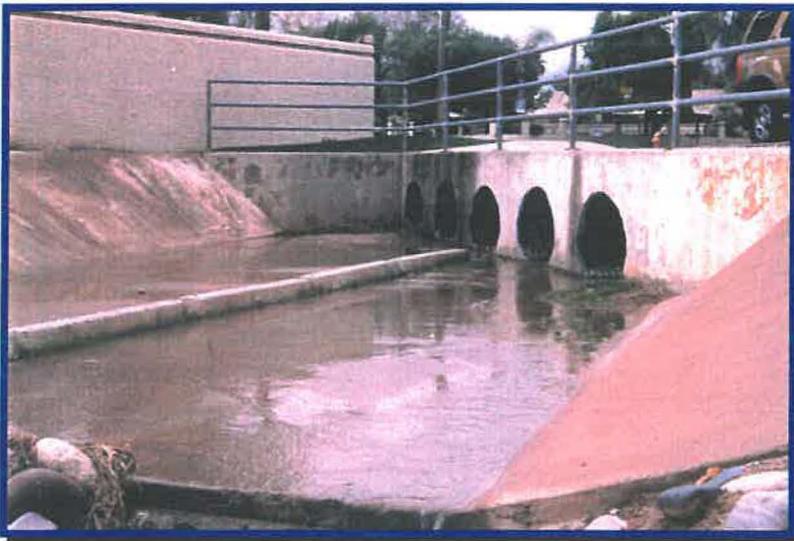
Pic 1.15:

Earth Channel (Wash-1) along the east side of 92nd Street and the west side of Scottsdale Vista No.2 looking upstream.



Pic 1.16:

Looking downstream at the trapezoidal earth channel (Wash-1) just south of Poinsettia Drive & west of 92nd Street within the Scottsdale Vista No.2 Subdivision. $Q_{100} = 549$ -cfs per drainage study no.14.



Pic 1.17:

Looking upstream at the 5-barrel CMP pipes crossing Poinsettia Drive approximately 250-feet west of 92nd Street. Discharge channel consist of concrete lined wing walls with energy dissipaters



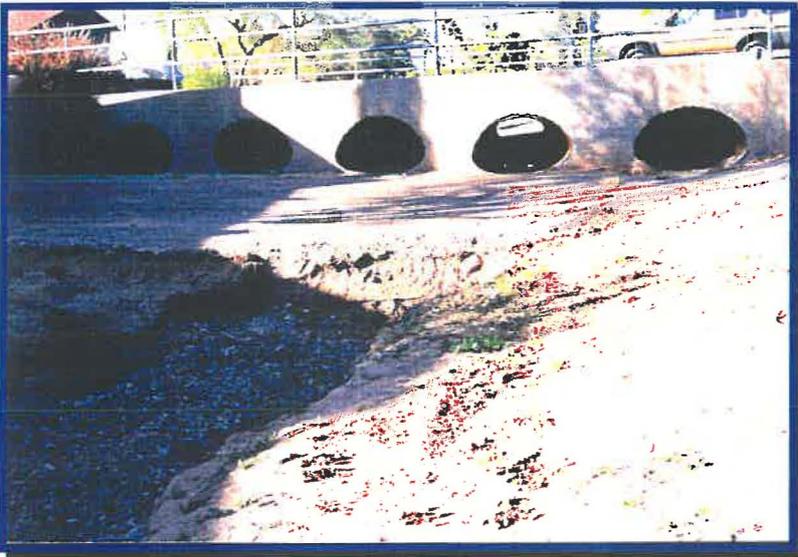
Pic 1.18:

Looking downstream at 5-barrel circular CMP pipe crossing Poinsettia Drive approximately 250-feet west of 92nd Street.



Pic 1.19:

Looking upstream at the graded earthen channel (wash-1) north of Poinsettia Drive approximately 250-feet west of 92nd Street.



Pic 1.19A:

Looking upstream at the channel and the 5-barrel elliptical pipes crossing Laurel Lane. The channel bottom has eroded approximately 200-feet downstream.



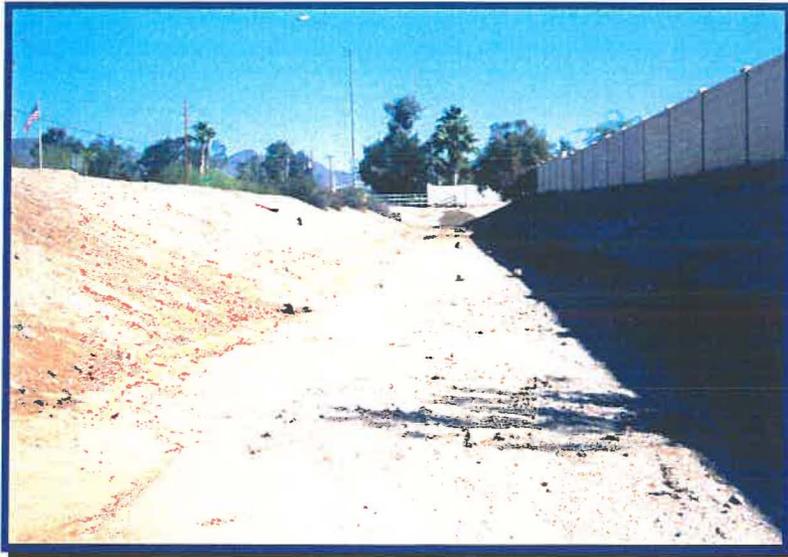
Pic 1.20:

Looking upstream at the 3-CMP pipes and 48"-RGRCP pipe with grate crossing Cactus Road located on the south side of Cactus. 3-CMP pipes are discharging flows north of Cactus as shown in Pic 3.6. The 48"-RGRCP pipe is a storm drain system originating north of Sweetwater Avenue within the 94th Street alignment.



Pic 1.21:

Looking downstream at the 3-CMP pipes crossing Cactus Road located on the north side of Cactus. It is unclear where flows are originating from to this structure.



Pic 1.22:

Looking downstream at the trapezoidal earthen channel located along the south side of Cactus Road.



Pic 1.23:

Looking upstream at the 3-CMP pipes crossing Cactus Road approximately 350-feet west of location in Pic 3.5.



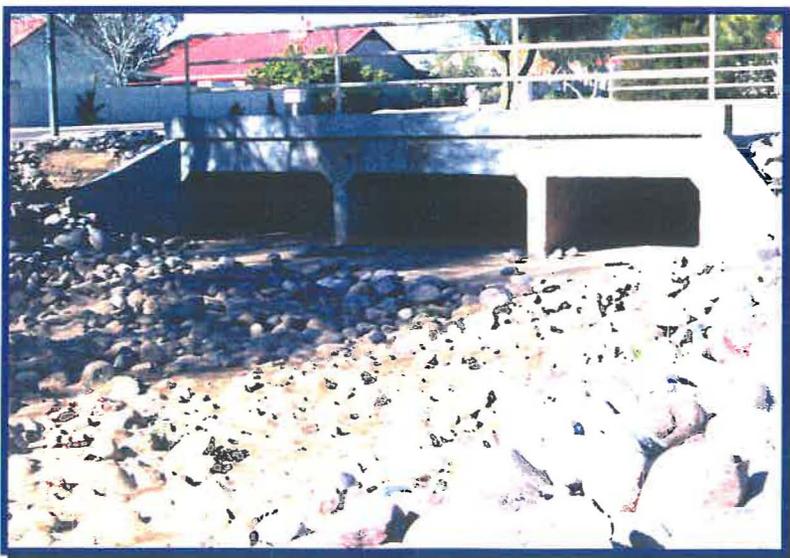
Pic 1.24:

Looking downstream at the 3-CMP pipes crossing Cactus Road located on north side of Cactus approximately 350-feet west of location in Pic 3.6.



Pic 1.25:

Looking upstream at the wall opening into the horse property located on north side of Cactus Road. It appears that collected debris obstruct storm flows.



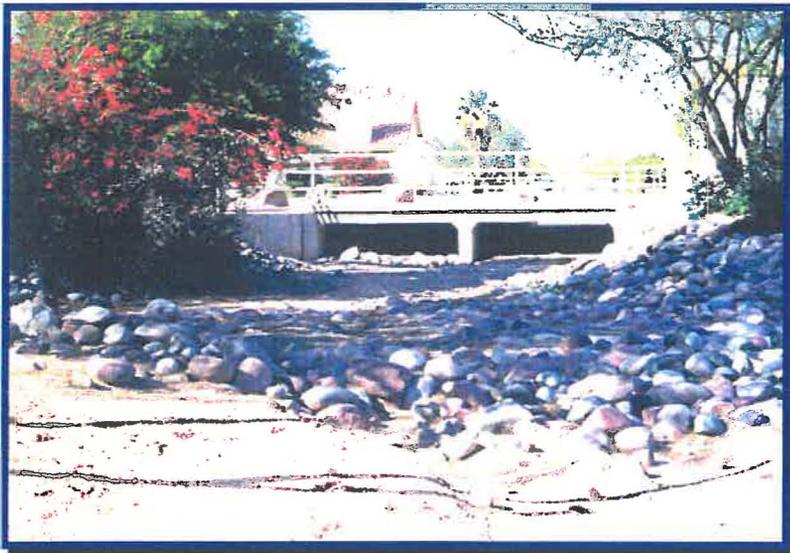
Pic 1.26:

Looking upstream at the 3-barrel box culvert crossing Larkspur Drive approximately 1550-feet west of 94th Street. The structure is discharging flows into a rip-rap lined channel (Wash-1).



Pic 1.27:

Looking downstream at Wash-1 rip-rap lined.



Pic 1.28:

Looking upstream at the 2-barrel box culvert crossing Sweetwater Avenue approximately 1400-feet west of 94th Street. The structure is discharging flows into a rip-rap lined channel (Wash-1).



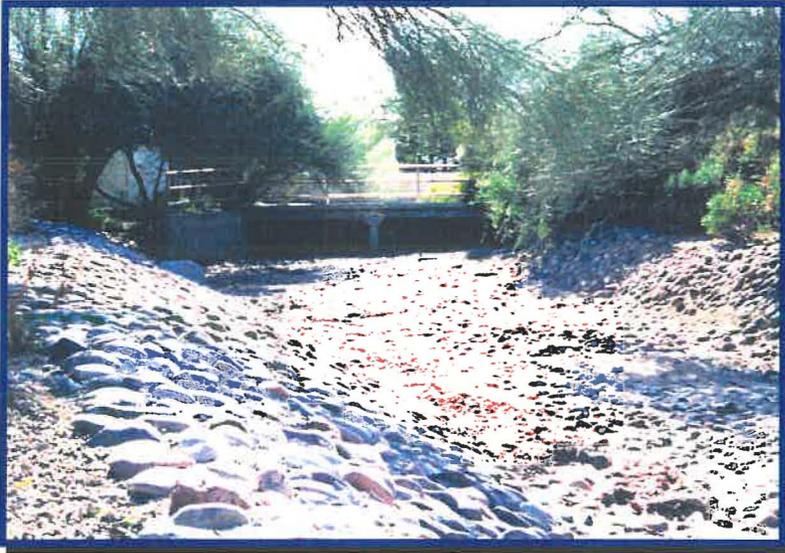
Pic 1.29:

Looking upstream at the 3-barrel box culvert crossing Pershing Avenue approximately 50-feet west of 92nd Street.



Pic 1.30:

Looking upstream at the graded trapezoidal earthen channel (Wash-1) north of Pershing Avenue.



Pic 1.31:

Looking downstream at the 2-barrel box culvert crossing 92nd Street just north of Sutton Drive.



Pic 1.32:

Looking upstream at the rip-rap lined trapezoidal channel along the east side of 92nd Street.



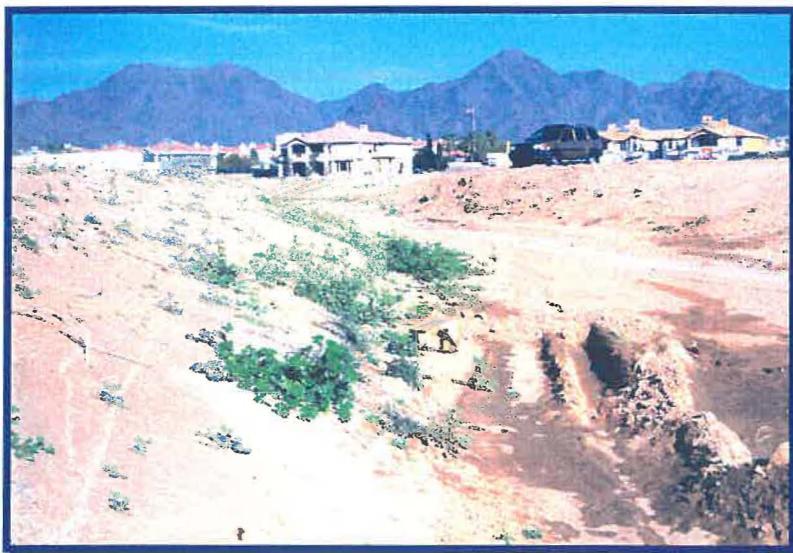
Pic 1.33:

Looking downstream at the box culvert crossing Davenport Drive south of Thunderbird Road.



Pic 1.34:

Looking downstream at the 2-barrel box culvert crossing Thunderbird Road approximately 350-feet east of 92nd Street.



Pic 1.35:

Looking upstream at the unimproved channel (Wash-1) through the existing Bella Vista commercial construction site.



Pic 1.36:

Looking downstream at the box culvert crossing Redfield Road just west of 94th Street within the Sonoran Vista Subdivision.



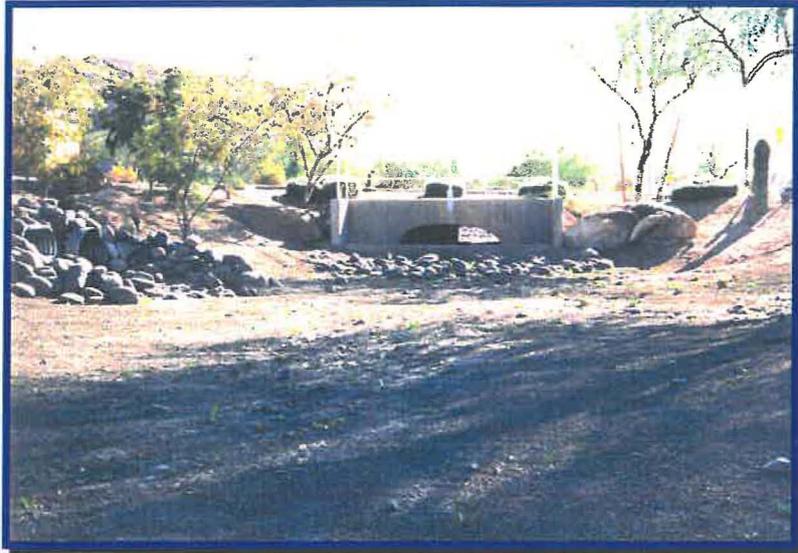
Pic 1.37:

Looking downstream at the box culvert crossing 94th Street just north of Redfield Road. Picture taken from the east side of 94th Street



Pic 1.38:

Looking downstream at the box culvert crossing the entrance way to the San Carlos Subdivision along the east side of 94th Street.



Pic 1.39:

Looking downstream at the box culvert crossing Raintree Drive just east of Thompson Peak Pkwy in the Osco Drug property.



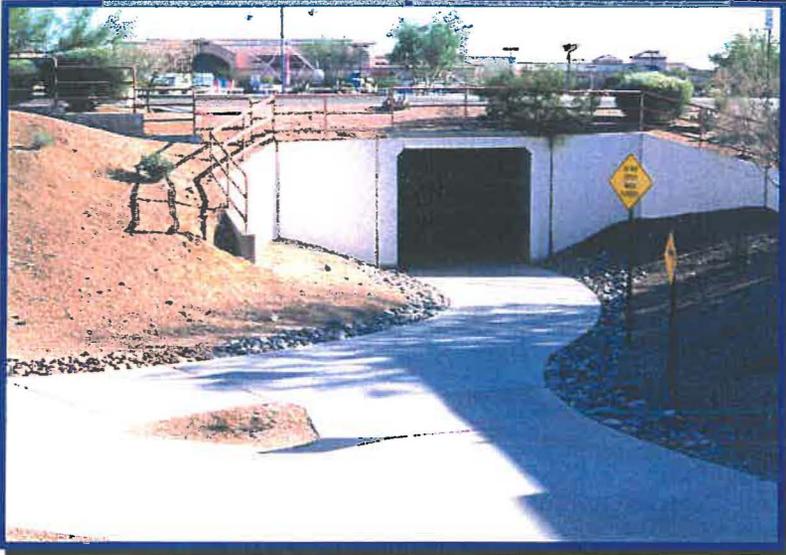
Pic 1.40:

Looking upstream at the box culvert crossing the entrance-way to the Osco Drug property. Culvert located approximately 300-feet north of Raintree Drive & Pic 3.20 and east of Thompson Peak Pkwy.



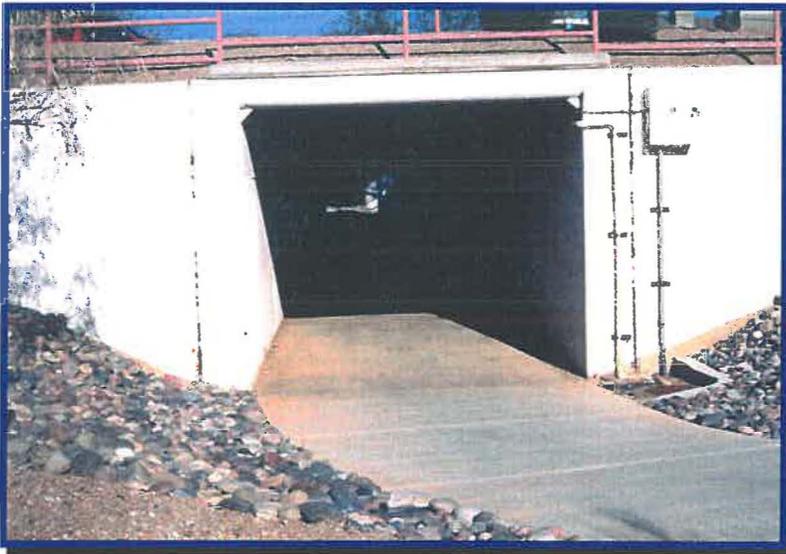
Pic 1.41:

Looking upstream at the box culvert/walk-way bridge crossing Thompson Peak Pkwy approximately 300-feet south of Frank Lloyd Wright.



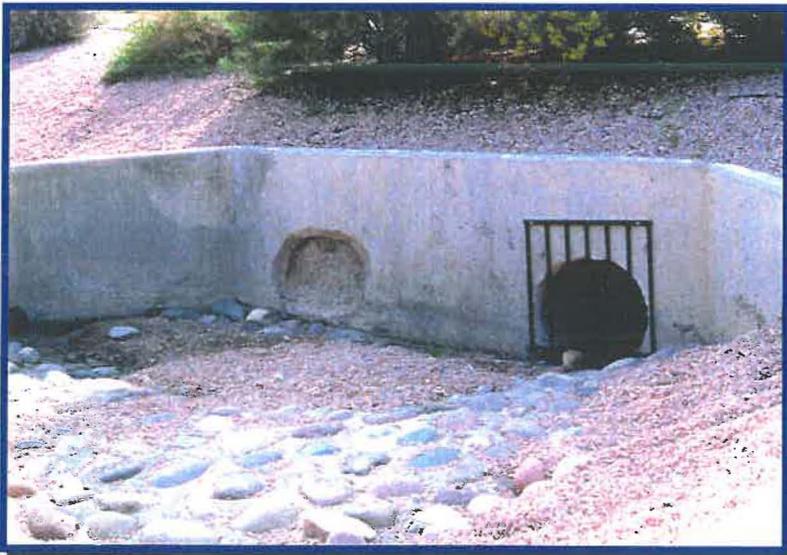
Pic 1.42:

Looking downstream at the box culvert/walk-way bridge crossing Thompson Peak Pkwy approximately 300-feet south of Frank Lloyd Wright.



Pic 1.43:

Looking upstream at the box culvert/walk-way bridge crossing Frank Lloyd Wright approximately 300-feet west of Thompson Peak Pkwy.

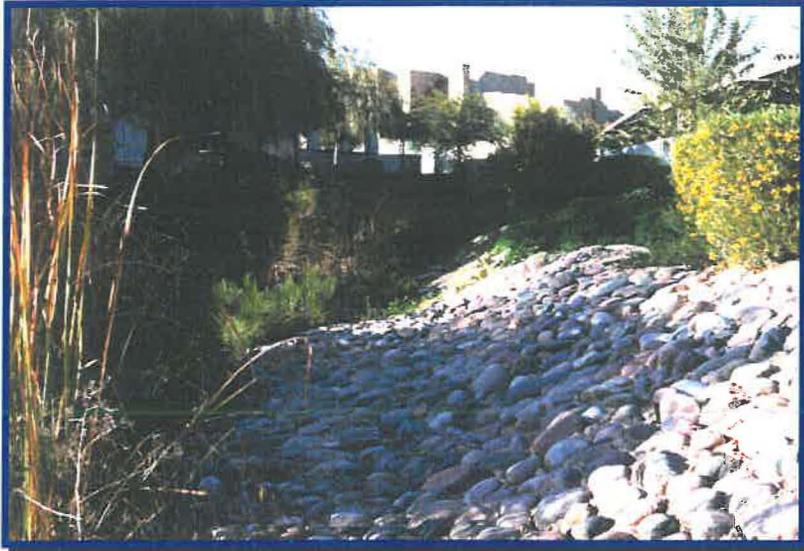


Pic 1.44:

Looking downstream at the RCP pipe crossing 100th Street. One of pipes has been blocked-off. The subject location is the most upstream point of Wash-1.

APPENDIX B-2

**PICTURES
WASH NO.1A**



Pic 1A.1:

Looking upstream at the earthen channel (Wash-1A) with rip-rap along the east bank. The channel upstream is covered with dense brush.



Pic 1A.2:

Looking upstream at the 2-barrel RCP pipes crossing Desert Cove. The pipes are partially covered with brush obstructing flow.



Pic 1A.3:

Looking downstream at the unimproved earthen channel (Wash-1A) covered with brush.



Pic 1A.4:

Looking upstream at the unimproved earthen channel along the west side of the Hospital.

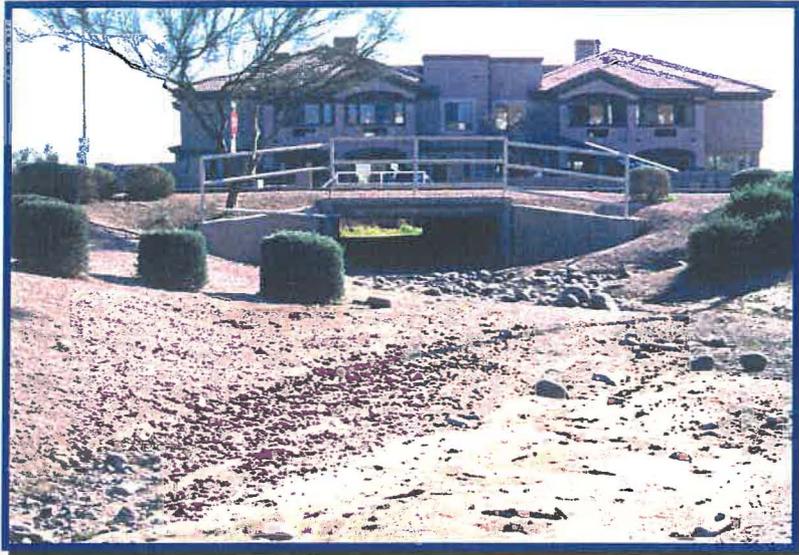


Pic 1A.5:

Looking downstream at the earthen channel converging and conveying flows to Wash-1. The channel banks are rip-rap lined.

APPENDIX B-3

**PICTURES
WASH NO.1B**



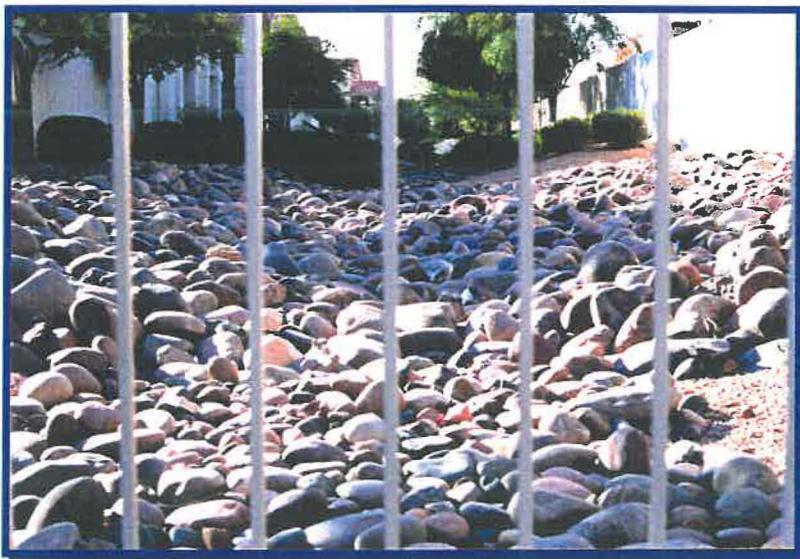
Pic 1B.1:

Looking downstream at Wash-1B and the box culvert crossing Redfield Road.



Pic 1B.2:

Looking upstream at Wash-1B and the box culvert crossing the north entrance to Sonoran Vista Subdivision west of 94th Street.



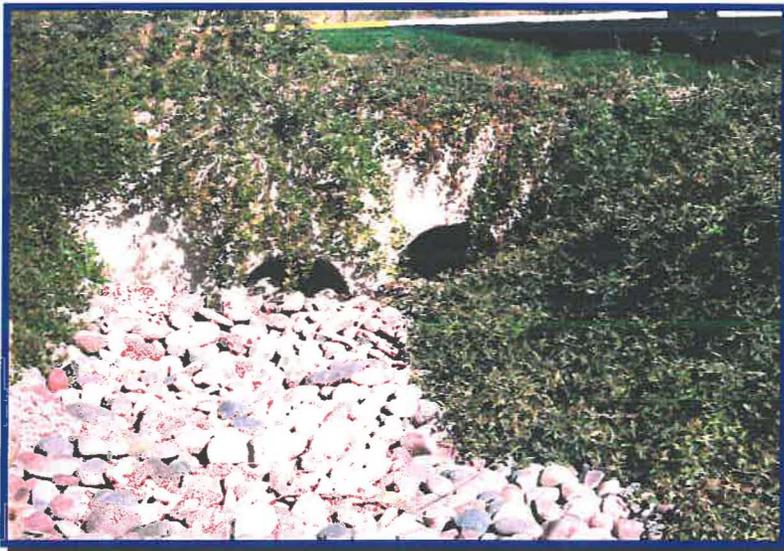
Pic 1B.3:

Looking upstream at the rip-rap lined drainage easement within the Sonoran Vista Subdivision conveying flows to Wash-1B.



Pic 1B.4:

The storm drain inlet within the Scottsdale Foothills Subdivision discharging flows to Wash-1B.



Pic 1B.5:

2-barrel pipe outletting flows to the Scottsdale Foothills Subdivision across Raintree Drive.

It appears that these off-site flow travel within the parking lot and eventually discharges into the storm drain system shown in Pic 1B.4 .

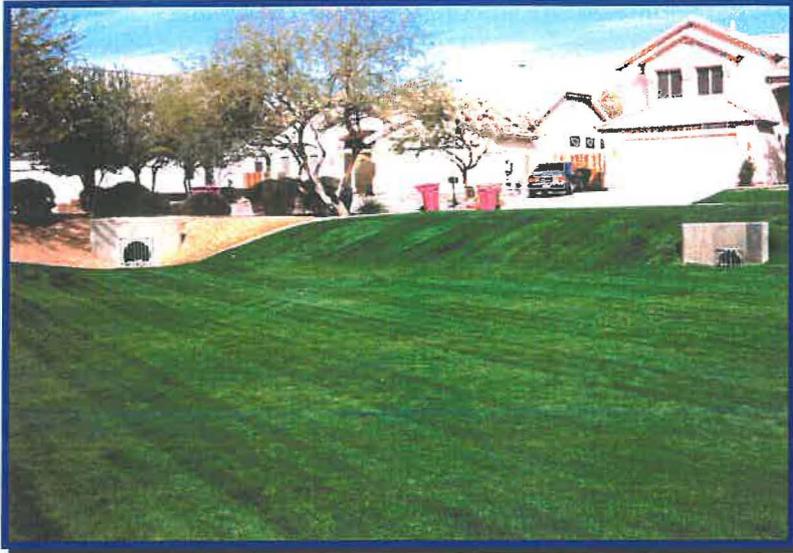


Pic 1B.6:

2-barrel RCP pipes located on the north side of Raintree Drive. It is unclear where these pipes are conveying flows, since there are no outlets on the south side of Raintree Drive. The property to the south of Raintree Drive and west of Scottsdale Foothills is been constructed at the present time.

APPENDIX B-4

**PICTURES
WASH NO.1C**



Pic 1C.1:

The retention basin located within the Montage Subdivision.



Pic 1C.2:

The emergency out-fall for the retention basin located in the Montage Subdivision shown in Pic 1C.1.



Pic 1C.3:

The block wall opening at the end of the cul-de-sac on 94th Place conveying overflow from the Montage Subdivision and flows from the subdivision east of Montage to a retention basin located along the west side of Thompson Peak Pkwy.

APPENDIX B-5

**PICTURES
WASH NO.1D**



Pic 1D.1:

Looking upstream at the box culvert crossing Redfield Road just east of 92nd Street within the Las Hadas subdivision. Storm flows are been conveyed from Scottsdale Foothills subdivision located at the southeast corner of 92nd Street and Raintree Drive.



Pic 1D.2:

The 3-barrel RCP pipe crossing the south entrance to Foothill Shadows subdivision along the east side of 92nd Street.



Pic 1D.3:

Looking downstream at the unimproved earthen channel (Wash-1D). The subject channel terminates approximately 400-feet south of Foothill Shadows subdivision.

APPENDIX B-6

PICTURES WASH NO.2 & 2B



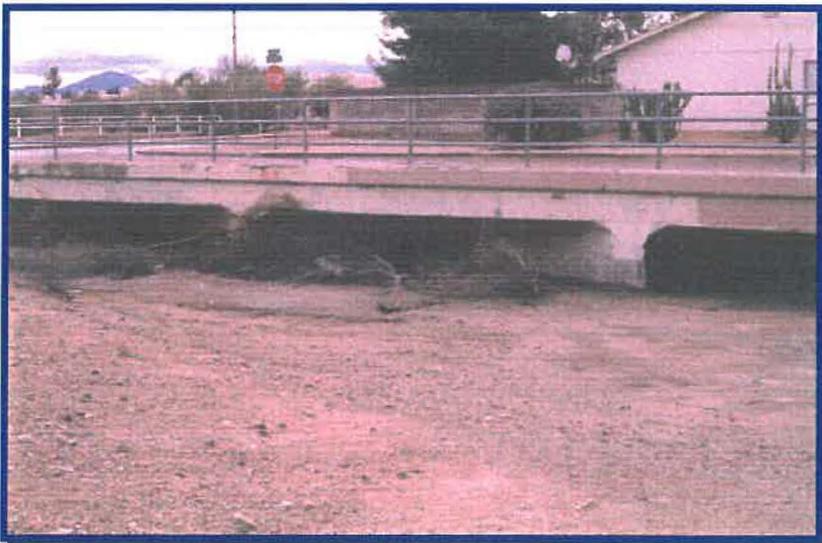
Pic 2.1:

Looking upstream at the Gabion lined channel in Wash-2.



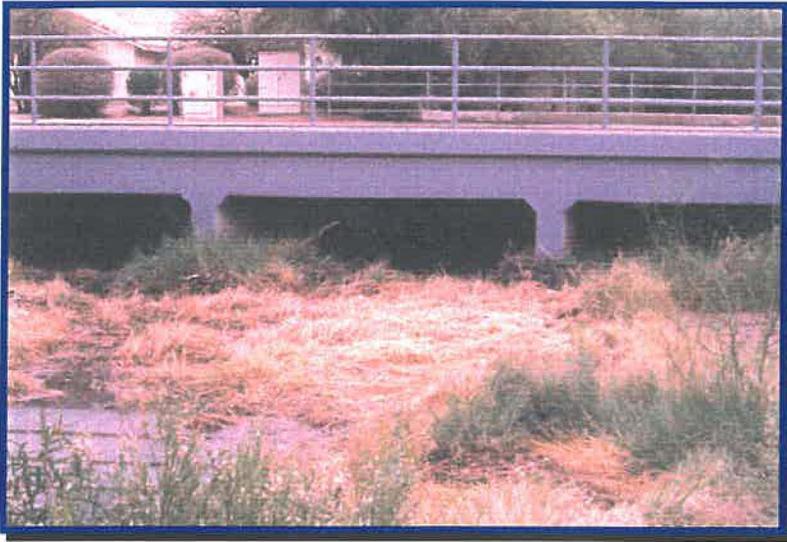
Pic 2.2:

Looking downstream at the earth channel in Wash-2 south of Cholla and approximately 1000-feet west of 96th Street.



Pic 2.3:

Looking downstream at the 3-barrel box culverts crossing 94th Way & the Cholla intersection.



Pic 2.4:

Looking downstream at the 3 Barrel Box Culverts Crossing Poinsettia Drive east of 94th Way. The wash upstream does not appear to be an improved channel.



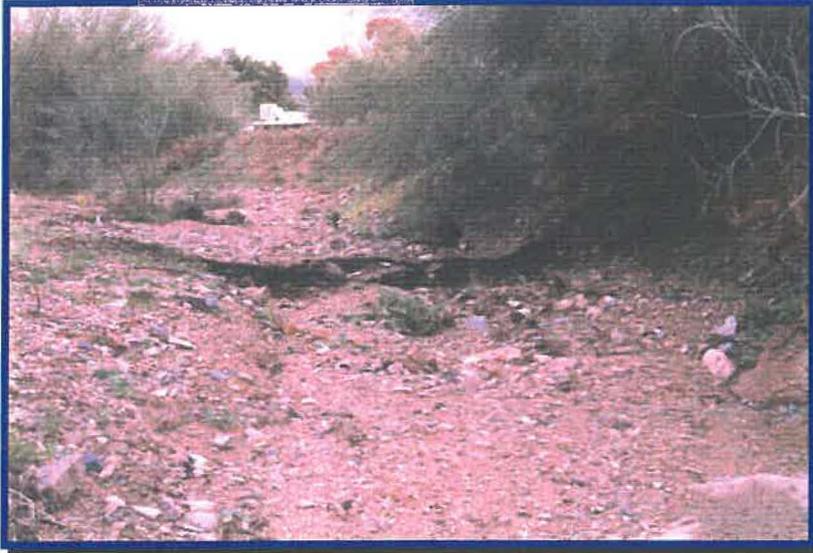
Pic 2.5:

Discharge of street flows from 94th Way into the channel (Wash-2).



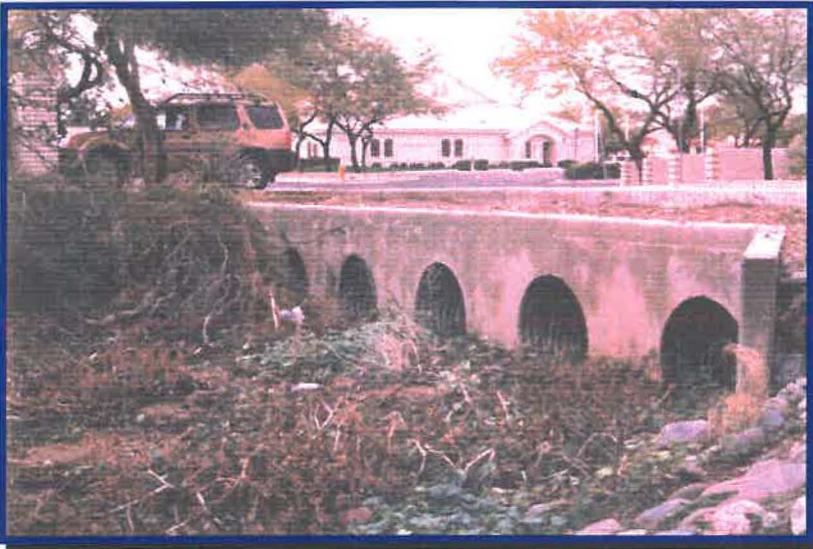
Pic 2.6:

Looking downstream at the 6-barrel elliptical CMP pipe crossing Cactus Road approximately 400-feet west of 96th Street.



Pic 2.7:

Looking upstream at the unimproved wash (Wash-2). It is also, apparent the erosion that has taken place at the channel bottom



Pic 2.8:

Looking upstream at the 6-barrel CMP pipe crossing Oak Drive west of 96th Street. The discharge culverts are obscured with debris especially west most pipe compared to the upstream end as shown in Pic 1.25.



Pic 2.9:

Looking downstream at the 6-barrel CMP pipe crossing Oak Drive west of 96th Street. The channel (Wash-2) approaching the pipes are rip-rap lined along the banks and bottom.



Pic 2B.1:

Looking upstream at the 2-barrel culvert crossing the intersection of 96th Street and Larkspur Drive in Wash-2B.



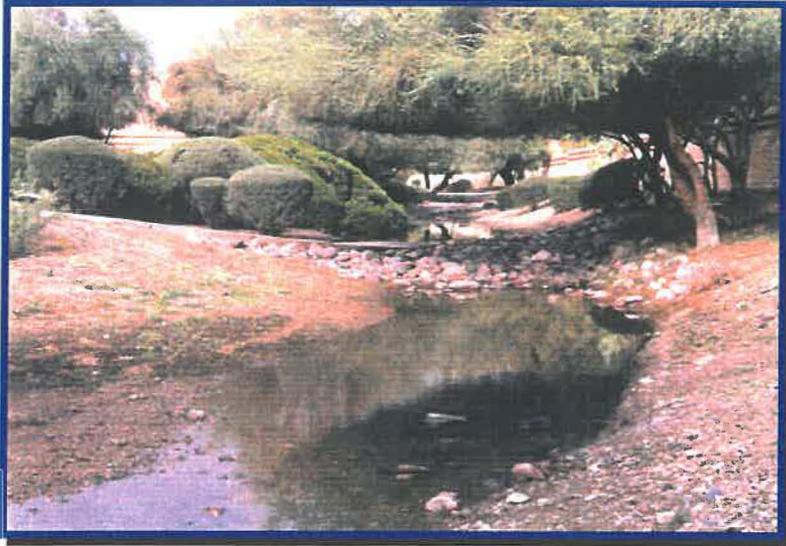
Pic 2B.2:

Looking downstream at the 2-barrel culverts with wing walls crossing the intersection of 96th Street and Larkspur Drive.



Pic 2B.3:

The sidewalk underdrains conveying street flows from Larkspur Drive into Wash-2B along a rip-rap lined channel at the intersection of 96th Street and Larkspur Drive.



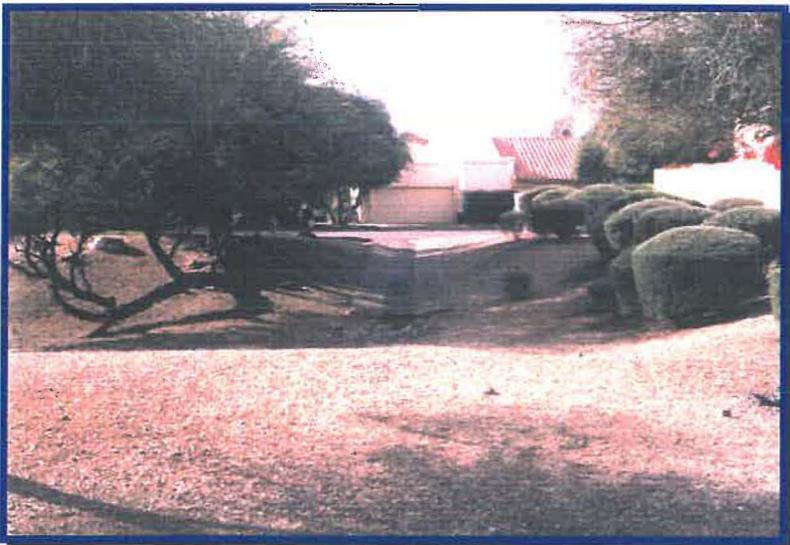
Pic 2B.4:

The Wash-2B looking upstream with equestrian facilities north of Larkspur Drive and east of 96th Street.



Pic 2B.5:

The Wash-2B looking downstream with the 2-barrel box culverts crossing Sweetwater Avenue. Upstream of this point the wash breaks into two segments.



Pic 2B-1.1:

Concrete Valley Gutter discharging flows from Sweetwater Ranch Village into Wash-2B-1.



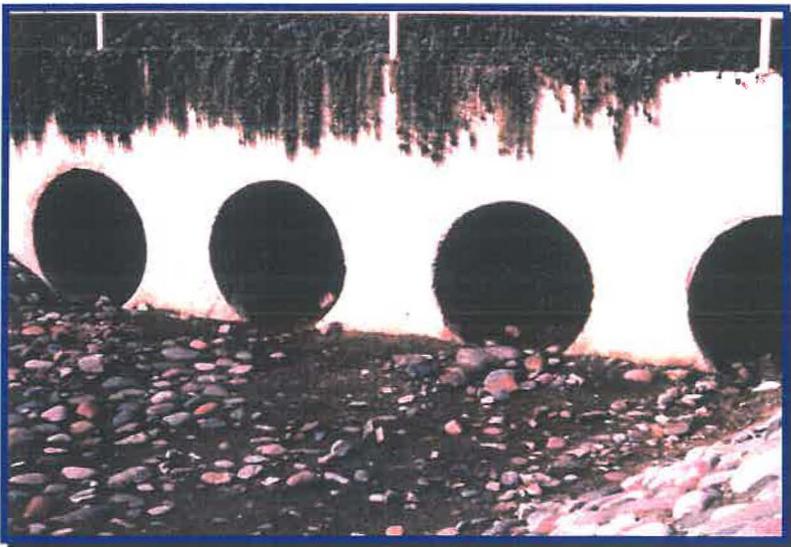
Pic 2B-1.2:

Looking downstream at the two CMP pipes crossing Pershing Avenue approximately 300-feet east of 96th Street.



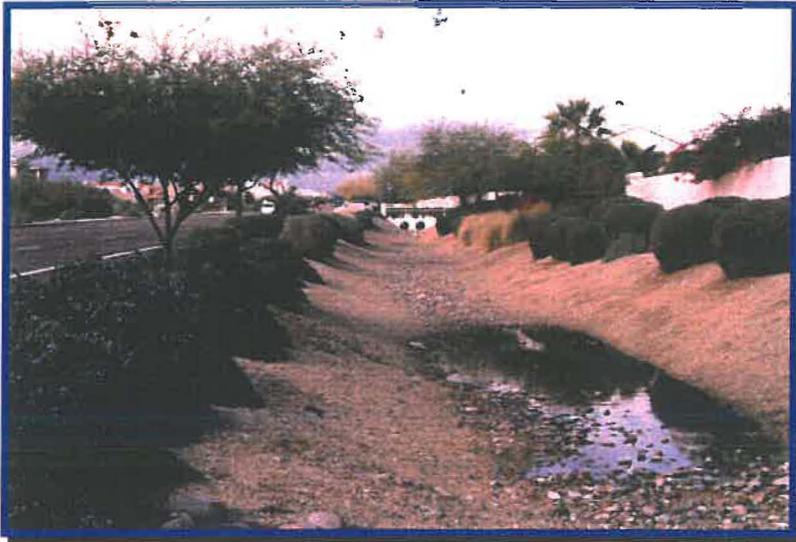
Pic 2B-1.3:

Looking upstream at the improved earthen channel north of Pershing Avenue approximately 300-feet east of 96th Street.



Pic 2B-1.4:

Looking upstream at the improved earthen channel with rip-rap lined banks discharging flows from the 4-barrel CMP pipes crossing Voltaire east of 96th Street.



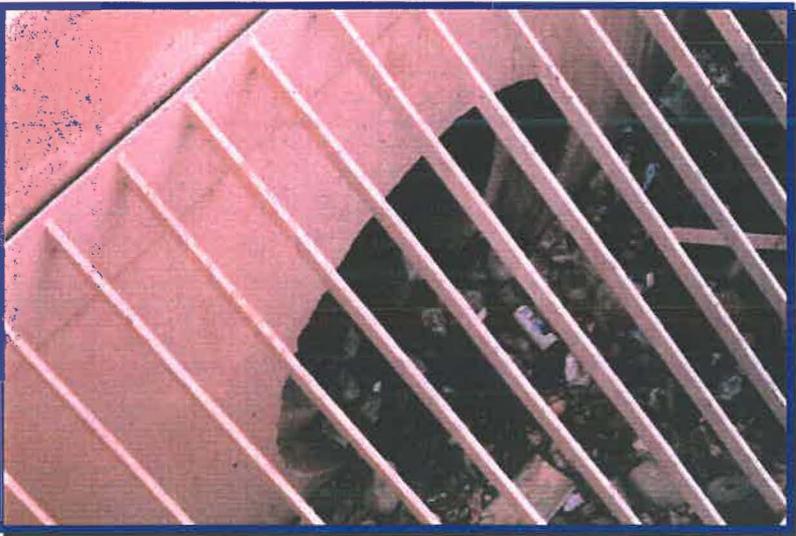
Pic 2B-1.5:

Looking upstream at the improved earthen channel north of Voltaire and along the eastside of 96th Street.



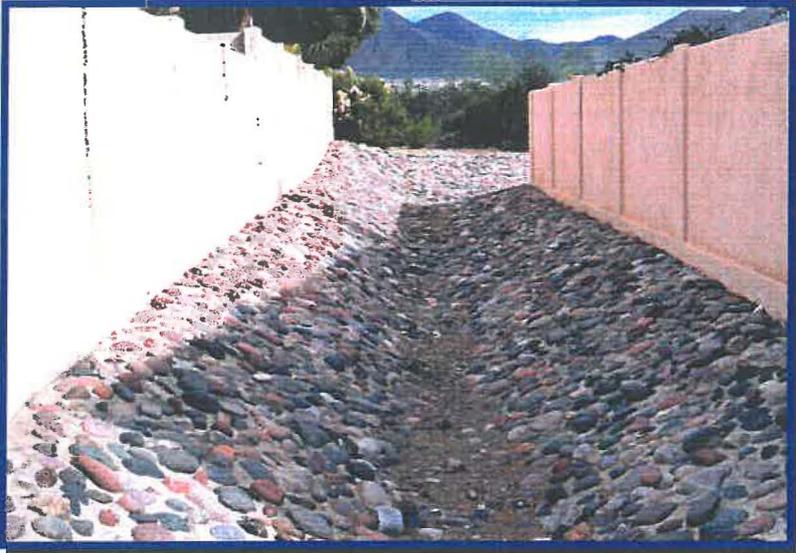
- Pic 2B-1A.1:

The rip-rap lined channel picking up flows from Thunderbird Road and discharging to the storm drain system shown in Pic 2B-1A.2.



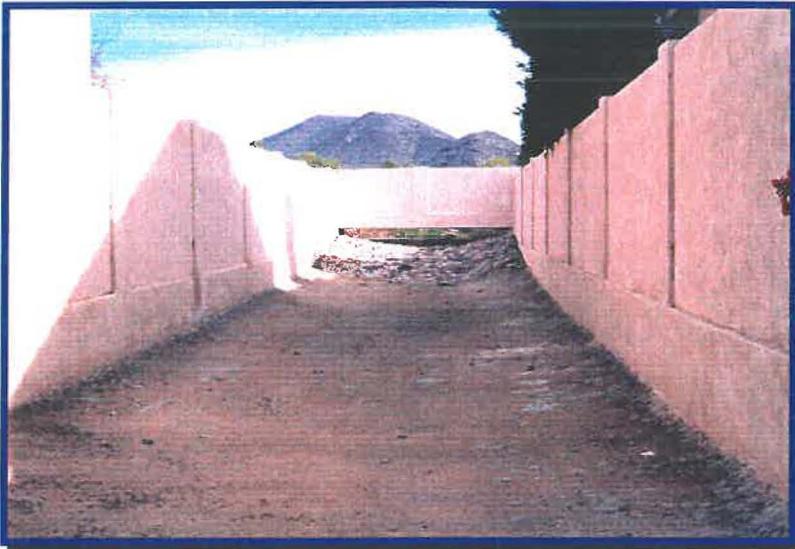
Pic 2B-1A.2:

Looking downstream at the storm drainage inlet with a bar screen at the end of Celtic Drive Cul-de-sac in the Camelot Ranch Subdivision.



Pic 2B-1A.3:

Looking upstream at the rip-rap lined channel between Celtic Drive and Sharon Drive within the Camelot Ranch Subdivision conveying flows to the storm drain system. Ultimately the storm drain system discharges into Wash-2B-1.



Pic 2B-1A.4:

Looking upstream at the drainage easement within the Camelot Ranch Subdivision conveying off-site flows from the undeveloped property to the east along Voltaire Drive. Ultimately the storm flows been discharge into Wash-2B-1.



Pic 2B-1.6:

Looking downstream at the retention basin located along the north side of Tunderbird Road within the Vista Del Rincon subdivision conveying the overflow to Wash 2B-1 approximately 350-feet east of 96th Street.



Pic 2B-1.7:

Looking upstream at the box culvert crossing 97th Place with wing walls.



- Pic 2B-1.8:

Looking downstream at the improved graded channel just outside the northeast boundary of Vista Del Rancor along the south side of Frank Lloyd Wright Boulevard.



Pic 2B-1.9:

Looking upstream at the 2-barrel RCP pipes crossing Frank Lloyd Wright Boulevard approximately 50-feet east of Redfield Road. The most upstream point of Wash 2B-1.

APPENDIX B-7

PICTURES WASH NO.2A & 2A-1



Pic 2A.1:

Looking upstream at the improved earthen channel (Wash-2A) located just north of Oak Drive. The channel at this point breaks-up into two branches, east(Wash-2B) & west(Wash-2A).



Pic 2A.2:

Looking upstream at the 5-barrel 24"-RCP pipe crossing Larkspur Drive just west of the Eldorado Private School site. The storm flows within Sweetwater Ranch Manor Unit II are part of the off-site flows been discharge at this point.



Pic 2A.3:

Looking downstream at the improved earthen channel(Wash-2A), north of Sweetwater Avenue and west of 96th Street.



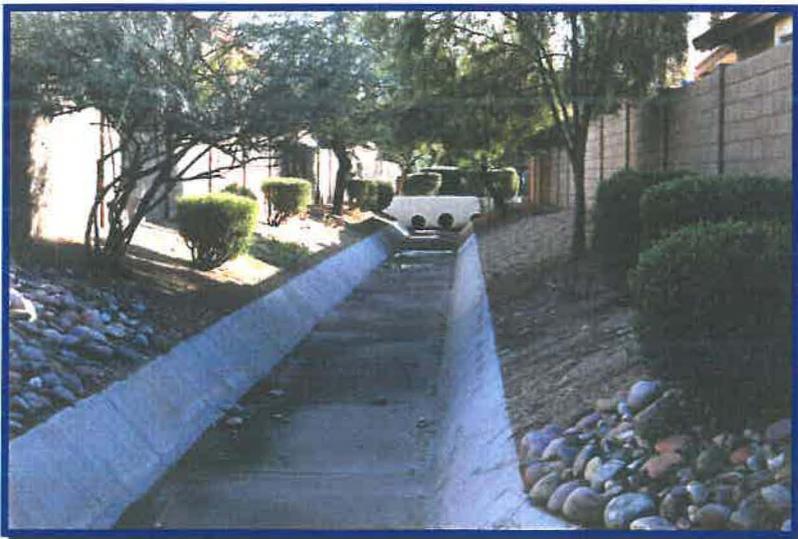
Pic 2A-1.1:

Looking downstream at storm drain inlet located on the south side of Thunderbird Road approximately 450-feet east of 94th Street.



Pic 2A-1.2:

The storm drain pipe outletting flows from the system shown in Pic 2A-1.1 into the retention basin.



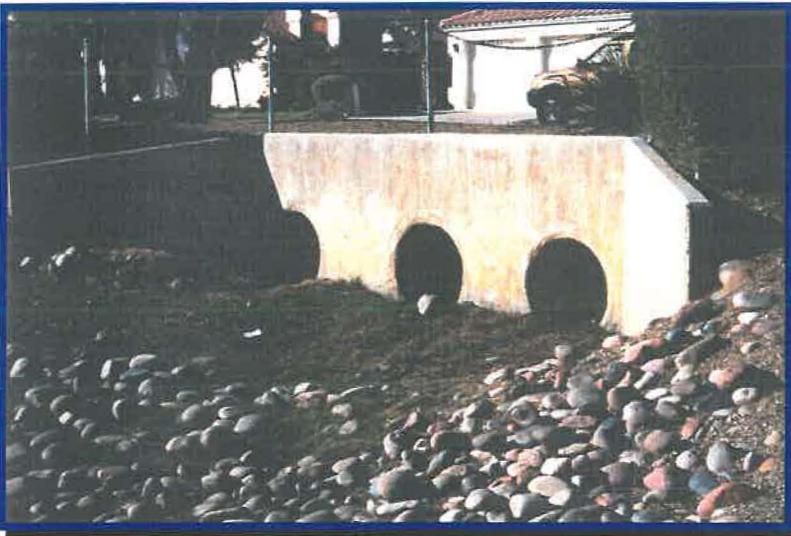
Pic 2A-1.3:

Looking downstream at the concrete lined trapezoidal channel south of Davenport Drive conveying overflow from the property north as shown in Pic 2A-1.2.



Pic 2A-1.4:

Looking upstream at the concrete lined trapezoidal channel south of Voltaire Drive.



Pic 2A-1.5:

Looking upstream at the 3-barrel RCP pipes crossing Presidio Road.



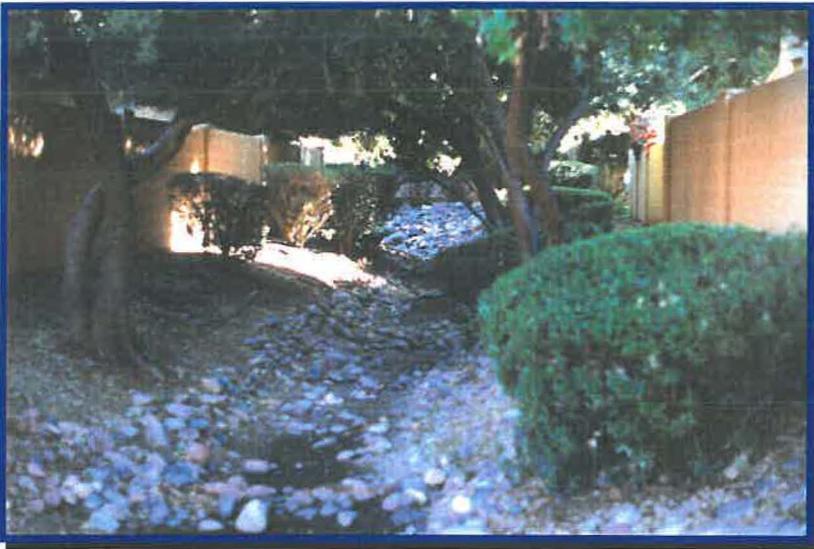
Pic 2A-1.6:

Looking downstream at the rip-rap lined channel conveying overflow from the property north of Sweetwater Ranch Manor.



Pic 2A-1.7:

Looking upstream at the 2-barrel box culvert crossing Wood Drive approximately 500-feet east of 94th Street.



Pic 2A-1.8:

Looking downstream at the rip-rap lined channel turning east and ultimately discharging flows to Wash-2A.



Pic 2A.4:

Looking downstream at Wash-2A from Voltaire Drive cul-de-sac west of 96th Street.



Pic 2A.5:

Looking upstream at the improved channel south of Thunderbird Road and west of 96th Street.



Pic 2A.6:

Looking downstream at the box culvert crossing Thunderbird Road west of 96th Street.



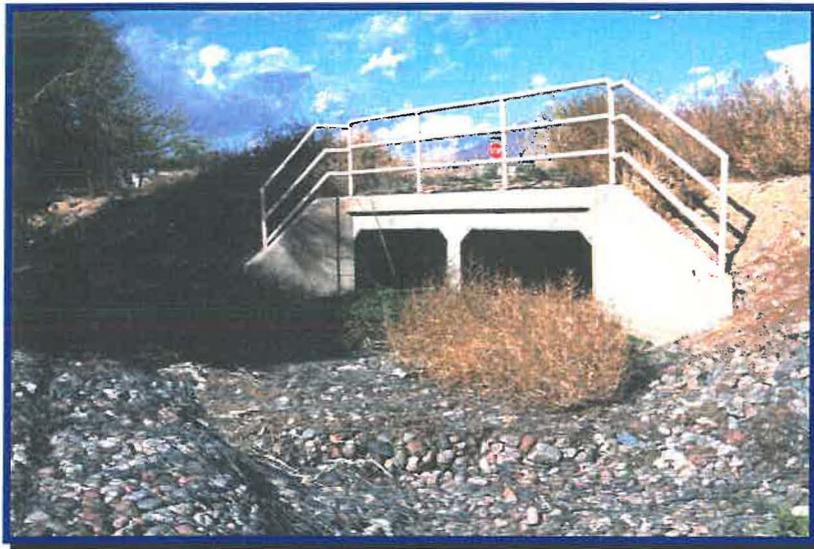
Pic 2A.7:

Looking upstream at the improved channel between the town homes north of Thunderbird Road and approximately 200-feet west of 96th Street.



Pic 2A.8:

Looking downstream at the unimproved channel south of Redfield Road and west of 96th Street outletting flows to the apartment complex through the wall opening.



Pic 2A.9:

Looking upstream at the 2-barrel box culvert crossing 96th Street.



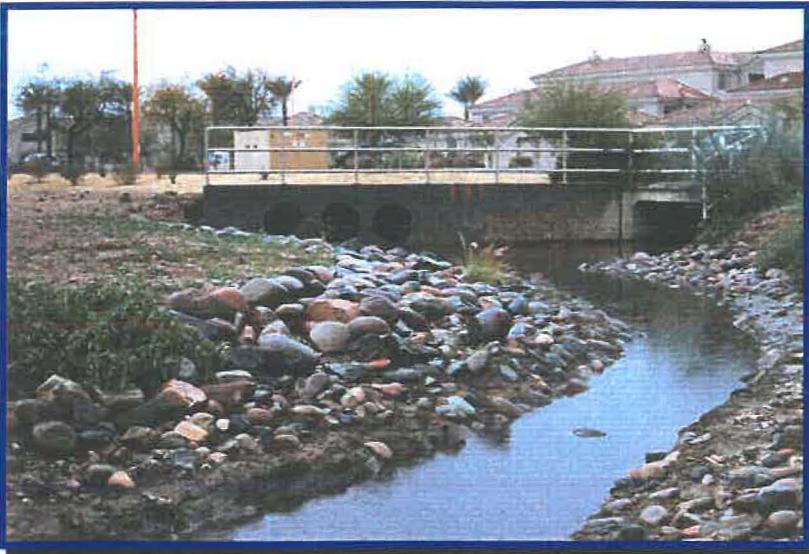
Pic 2A.10:

Looking upstream of Pic 2A.9 on the east side 96th Street.



Pic 2A.11:

Looking upstream at the 2-barrel box culvert crossing Redfield Road.



Pic 2A.12:

Looking upstream at the 3-barrel 24"-RGRCP pipes conveying flows across Frank Lloyd Wright Blvd (FLW) from the Mirada subdivision & the box culvert crossing Frank Lloyd Wright Blvd conveying flows north of FLW.



Pic 2A.13:

Looking upstream at the 2-barrel RCP pipes conveying flows from Wash-2A.3 located on the north side of FLW.



Pic 2A.14:

Looking downstream at the
box culvert crossing FLW
located on the north side of
FLW.

APPENDIX B-8

**PICTURES
WASH NO.2B-2**



Pic 2B-2.1:

Concrete Valley Gutter and walk-way discharging flows from Sweetwater Ranch Foothills into Wash-2B-2.



- Pic 2B-2.2:

Looking upstream at the concrete box culvert crossing Pershing Avenue approximately 500-feet east of 96th Street.



Pic 2B-2.3:

Looking upstream at the improved earthen channel north of Pershing Avenue and east of 96th Way.



Pic 2B-2.4:

Looking downstream at the concrete lined drainage easement conveying storm flows to Sweetwater Ranch Village and channel shown in Pic 2B-2.3.

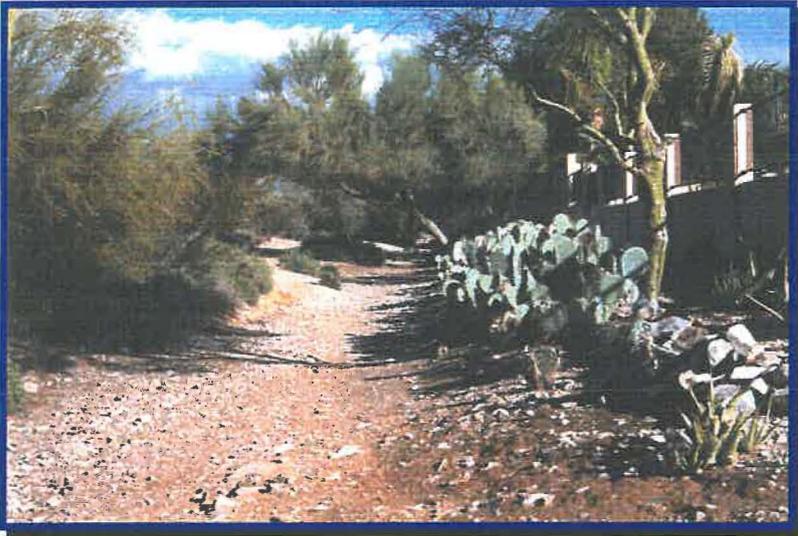
APPENDIX B-9

**PICTURES
WASH NO.2B-3**



Pic 2B-3.1:

Looking downstream at the unimproved earthen channel (Wash-2B-3) located just north of Sweetwater Ranch Foothills subdivision. The channel is conveying flows west of 96th Street



Pic 2B-3.2:

Looking upstream at the channel described in Pic 2B-3.1.



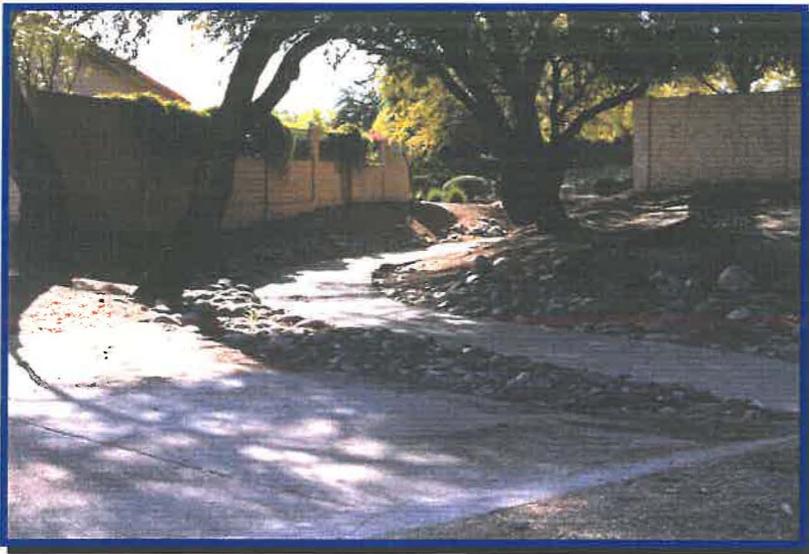
Pic 2B-3.3:

Looking upstream at the graded earthen channel described in Pic 2B-3.1 turning east.



Pic 2B-3.4:

Looking downstream at the improved earthen channel located west of 97th Street.



Pic 2B-3.5:

Looking downstream at the improved earthen channel with a concrete lined walk-way located west of 97th Street turning west within the Sweetwater Ranch Village subdivision and ultimately discharging flows to Wash-2B.

APPENDIX B-10

PICTURES **WASH NO.2C, 2C-1, & 2C-2**



Pic 2C-1.1:

Looking upstream at the improved earthen channel north of Sutton Drive (Wash-2C-1) west of 100th Street conveying off-site flows from the school property located just north.



Pic 2C-2.1:

Looking upstream at the improved earthen channel north of Sutton Drive and approximately 400-feet east of Pic 2C-1.1 (Wash-2C-2) west of 100th Street conveying off-site flows from the school property located just north.



Pic 2C-2.2:

Looking upstream at the box culvert crossing the end of the cul-de-sac on Sutton Drive.



Pic 2C.1:

Looking upstream at the improved earthen channel located north of Dreyfus Avenue and west of 96th Street within the Sweetwater Ranch Foothills Subdivision.



Pic 2C.2:

Concrete Valley approximately 30-foot wide conveying flows from 98th Place (west half of Sweetwater Ranch Foothills Subdivision) into Wash-2C.



Pic 2C.3:

Concrete Valley approximately 30-foot wide conveying flows from Dreyfus Avenue (east half of Sweetwater Ranch Foothills Subdivision) into Wash-2C.



Pic 2C.4:

Looking downstream at the box culvert crossing Sweetwater Avenue.



Pic 2C.5:

Looking upstream at the box culvert crossing Sweetwater Avenue (downstream of Pic 2C.4).



Pic 2C.6:

Looking downstream at Wash-2C diverge into a east & west branch.



Pic 2C.7:

Looking downstream of Wash-2C after divergence as shown in Pic 2C.6.



Pic 2C.8:

Looking upstream of Wash-2C north of Windrose Drive.



Pic 2C.9:

Looking downstream at the 3-pipes crossing Windrose Drive. The pipes appear to be partially blocked with debris.



Pic 2C.10:

Looking upstream at the 3-pipes crossing Windrose Drive (downstream of Pic 2C.9). Stagnant storm water just downstream of the pipes.



Pic 2C.11:

Looking downstream at Wash-2C turning west.



Pic 2C.12:

Looking upstream at the box culvert crossing the cul-de-sac on Desert Terrace east of 98th Street.

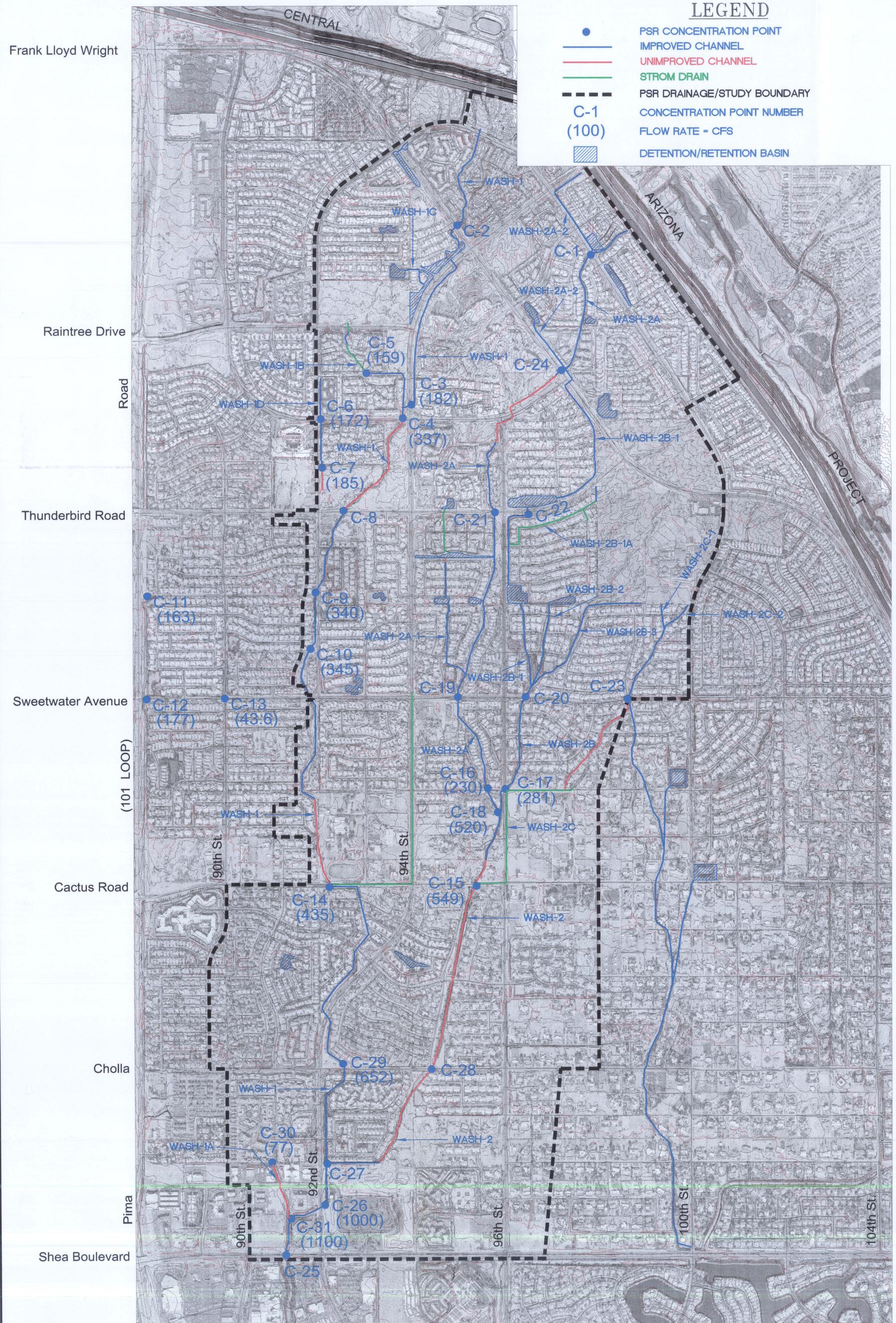


Pic 2C.13:

Looking downstream at Wash-2C and the block wall opening conveying flows to Sweetwater Estates Subdivision and ultimately discharging to the storm drain system within Larkspur Drive.

LEGEND

- PSR CONCENTRATION POINT
- IMPROVED CHANNEL
- UNIMPROVED CHANNEL
- STROM DRAIN
- PSR DRAINAGE/STUDY BOUNDARY
- C-1**
(100) CONCENTRATION POINT NUMBER
FLOW RATE - CFS
- DETENTION/RETENTION BASIN



City of Scottsdale
Upper Camelback Walk
Flood Control Improvements
Existing Drainage Plan



WILLDAN
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LEGEND

-  PHOTO NUMBER AND DIRECTION OF PHOTO
-  LOCATION OF PHOTO TAKEN
-  PSR DRAINAGE/STUDY BOUNDARY
-  EXISTING DRAINAGE
-  DETENTION/RETENTION BASIN

Frank Lloyd Wright

Raintree Drive

Road

Thunderbird Road

Sweetwater Avenue

(101 LOOP)

Cactus Road

Cholla

Pima

Shea Boulevard



City of Scottsdale
 Upper Camelback Walk
 Flood Control Improvements
 Photo Index Plan



WILLDAN
 Serving Public Agencies

Frank Lloyd Wright

Raintree Drive

Road

Thunderbird Road

Sweetwater Avenue

(101 LOOP)

Cactus Road

Cholla

Pima

Shea Boulevard

CENTRAL

ARIZONA

PROJECT

LEGEND



DRAINAGE PARCEL



DRAINAGE EASEMENT



PSR DRAINAGE/STUDY BOUNDARY



EXISTING DRAINAGE



City of Scottsdale Upper Camelback Walk Flood Control Improvements Drainage Easements/Parcels



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